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Hiroyuki Kobayashi

For: STORING APPARATUS AND PASSWORD  
CONTROL METHOD

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Fee Calculation For Claims As Filed

a) Basic Fee						\$ 790.00
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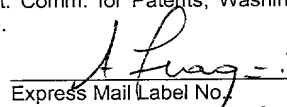
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TITLE OF THE INVENTION

Storing apparatus and password control method

BACKGROUND OF THE INVENTION

5           The present invention relates to a storing  
apparatus such as hard disk drive, optical disk drive,  
or the like which is connected to information  
processing equipment such as computer, word processor,  
electronic book, or the like and to a password control  
10       method. More particularly, the invention relates to a  
storing apparatus for protecting an access of  
information recorded on a medium by a password and  
relates to its password control method.

          Hitherto, in a storing apparatus such as hard disk  
15       drive, optical disk drive, or the like, data recorded  
on a medium is protected by using a password. That is,  
an identification confirmation is performed by a  
password so that only a specific person is authorized  
to read and write data from/to the medium of the  
20       storing apparatus and the other persons are not allowed  
to access to the data. For example, a password is  
preliminarily written and stored in a storing apparatus  
or a storage medium. When the user inputs his password  
at the time of using the storing apparatus and the  
25       password inputted by the user and the password stored  
on the apparatus side coincide with each other, a write  
command or a read command to the storing medium is

accepted. When the passwords do not coincide, the  
write or read command is not accepted and an error is  
returned. A system of authorizing a person by the  
password as mentioned above is not limited to the  
5 access protection of the storing apparatus but is used  
in many cases such as a use of a terminal apparatus in  
a data communication system and the like. The  
protection system using the password is widely used  
since a predetermined effect can be expected although  
10 it is a technique which can be easily employed.

Since the access protection using the password as  
mentioned above is widely used, however, an individual  
user has a number of passwords and it is often  
difficult to remember all of the passwords. When the  
15 user forgets the password which is used by himself,  
there is a problem such that even the authorized user  
cannot access. There is, accordingly, a way of use  
such that the user records the password in a notebook  
or the like and confirms the password in the notebook  
20 each time the apparatus is used. This results in a  
problem such that the password is known by stealingly  
seeing the notebook of the user. In the access  
protection using the password, since it is presumed  
that the user is urged to input the password every  
25 access, a third party such as a colleague of the user's  
place of work has many chances to see the password.  
Those problems are problems accompanied by the

operation which always requires an input of a password when the apparatus is used. A technique which can further reduce the frequency of inputting the password by the user while performing the access protection by the password is demanded. As a method of solving the problem, a method of stopping the access protection by the password by eliminating the password at an arbitrary use time point and newly setting a password when the access protection is necessary can be considered. That is, it is a method of setting a password only for a period of time in which the protection is necessary and receiving the access protection. The method has, however, the following problems. First, when a password is set again, the user often sets a password different from the previous password, so that a password management becomes complicated. That is, the user is likely to forget the newest password. Second, there is a danger that a third party steals a glance at a scene when the user resets the password.

#### SUMMARY OF THE INVENTION

According to the invention, there are provided a storing apparatus and its password control method in which an access is permitted without needing an input of a password by the user depending on a use scene without losing a function of an access protection by a

password.

According to the invention, a storing apparatus for protecting an access of information recorded on a medium by a password has a password preserving unit and a password verifying unit. The password preserving unit preserves a default input password and a password for access protection. When there is no password input from the user, the password verifying unit substitutes the default input password for the user input password and compares and collates the default input password with the password for access protection, thereby controlling the access protection. When there is a password input by the user, the user input password and the password for access protection are compared and collated, thereby controlling the access protection. Especially, when the password preserving unit preserves the same value as a default input password and a password for access protection, even if there is no password input by the user, the password verifying unit substitutes the default input password for the user input password and collates the default input password with the password for access protection, thereby permitting the access. According to the invention as mentioned above, when the default input password is stored on the storing apparatus side and there is no password input from the user, the password verification is performed by regarding the default input password as

a user input password. Consequently, by setting the default input password and the password for access protection to the same value, even when the user does not input the password, the access is permitted and an access by an ordinary command can be performed and the password input by the user can be omitted.

The password preserving unit further has a user input password area for storing the user input password. At the start of the use of the apparatus such as turn-on of a power source, command reset, error reset, medium insertion, or the like, the password verifying unit reads out the default input password and writes it into the user input password area. Subsequently, the password verifying unit establishes access permission or access inhibition on the basis of a collation coincidence between the default input password in the user input password area and the password for access protection. After establishing the access permission, each time the password is inputted by the user, the user input password is written in the user input password area and the access permission or the access inhibition is established on the basis of a collation coincidence with the password for access protection.

In case of using a form in which the user certainly needs to perform the input operation of the password, at the start of the use of the apparatus, the

password verifying unit waits for the input of the password by the user in a state such that the default input password has been read out and written into the user input password area. When there is the password  
5 input by the user, after the default input password in the user input password area was overwritten by the user input password, the password verifying unit collation compares it with the password for access protection, thereby controlling the access protection.  
10 When the default input password and the password for access protection are different, information is naturally protected from access as long as the user does not input the authorized password for access protection.  
15 The password preserving unit preserves the default input password and the password for access protection into the medium. In this instance, at the start of the use of the apparatus, the password verifying unit reads out the default input password and the password for  
20 access protection from the medium, stores them into a work memory of the unit in the apparatus, and controls the access protection. The password preserving unit can also preserve the default input password and the password for access protection into a non-volatile  
25 memory of the apparatus main body. Further, the password preserving unit can also preserve the default input password into the non-volatile memory of the

apparatus main body and preserve the password for access protection into the medium. In this case, at the start of the use of the apparatus, the password verifying unit reads out the password for access protection from the medium, stores them into the work memory of the apparatus main body, and controls the access protection. Further, the password preserving unit preserves the password for access protection into the non-volatile memory of the apparatus main body and preserves the default input password into the medium. In this case, at the start of the use of the apparatus, the password verifying unit reads out the default input password from the medium, stores it into the apparatus main body, and controls the access protection.

15       The medium has a password preserving area for preserving the password into a special area which cannot be accessed by the user by ordinary read command and write command, thereby preventing that the password is read out by the ordinary read command or is

20       rewritten by the write command. Further, there is provided a password rewriting unit for rewriting the default input password or the password for access protection on the basis of a dedicated command from a host system serving as an upper apparatus. As a

25       medium, a medium fixedly enclosed in the apparatus main body or a removal medium which is detachable for the apparatus main body can be also used.



The password preserving unit preserves a plurality of kinds of passwords for access protection according to the kinds of access protection. The password verifying unit permits the access by an ordinary command corresponding to the kind of password for access protection in which the collation coincidence is obtained. For example, the password preserving unit preserves a write/read password for permitting the access by the read and write commands and a read only password for permitting only the access by the read command as passwords for access protection. The password verifying unit permits the access by the ordinary write or read command when the collation coincidence of the write/read password is obtained and permits the access only by the ordinary read command when the collation coincidence of the read only password is obtained.

Further, a validity term setting unit for setting a validity term in the default input password is provided. A state where the password input can be omitted is limitedly continued only for a predetermined period of time, thereby preventing that an unprotected state continues for an inadvertent long period. On the contrary, a method of setting the apparatus into the state where the password can be omitted after the elapse of a predetermined period of time can be also used. That is, by equalizing the default password to

the password for access protection after a predetermined period, the apparatus can be set into a state in which the access can be performed after the predetermined period even if a password is not  
5 inputted. The validity term setting unit counts the number of times of using the apparatus by a counter. When a count value of the counter reaches a predetermined value, the default input password is forcedly changed to a different value, thereby  
10 disabling the apparatus to be used. The validity term setting unit sets a time of a validity term. If the present time when the apparatus is used exceeds the validity term, the default input password is forcedly changed to a different value, thereby disabling the  
15 apparatus to be used.

According to the invention, there is provided a password control method for protecting an access of information recorded on a medium by a password, comprising:

20 a password preserving step of preserving a default input password, a password for access protection, and a user input password; and

a password verifying step of controlling an access protection by substituting the default input password  
25 for the user input password and comparison collating the default input password and the password for access protection when there is no password input from the

user and of controlling an access protection by comparison collating the user input password and the password for access protection when there is a password input by the user.

5           When the same value is preserved as a default input password and a password for access protection, even if there is no password input by the user, in the password verifying step, the default input password is substituted for the user input password and the default  
10   input password is collated to the password for access protection, thereby permitting the access. The password preserving step is characterized by preserving a plurality of kinds of passwords for access protection according to the kind of access protection. The  
15   password verifying step is characterized by permitting the access by an ordinary command corresponding to the kind of password for access protection in which the collation coincidence is obtained. Further, a validity term setting step of setting a validity term into the  
20   default input password is provided. The detailed construction other than the above construction is substantially the same as the apparatus construction.

          The above and other objects, features, and advantages of the present invention will become more  
25   apparent from the following detailed description with reference to the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of a hard disk drive to which the invention is applied;

Fig. 2 is a functional block diagram of an  
5 embodiment of the invention in which a password has been preserved in a drive main body;

Fig. 3 is an explanatory diagram for an access  
protecting process for capturing an access permission  
by a default input password in the case where there is  
10 no password input by the user;

Fig. 4 is an explanatory diagram for a command  
rewriting process of the default input password and a  
password for access control;

Fig. 5 is an explanatory diagram of an access kind  
15 in the invention;

Fig. 6 is an explanatory diagram of a preserving  
mode of passwords in the invention;

Fig. 7 is a functional block diagram of an  
embodiment of the invention in which a password has  
20 been preserved in only a medium;

Fig. 8 is an explanatory diagram of a password  
preserving area in the medium in Fig. 7;

Fig. 9 is a functional block diagram of an  
embodiment of the invention in which a password has  
25 been separately preserved in the drive main body and  
the medium;

Fig.10 is a functional block diagram of another

embodiment of the invention in which a password has been separately preserved in the drive main body and the medium;

Fig. 11 is a flowchart for an access protecting process in the case where there is no password input by the user;

Fig. 12 is a flowchart for an access protecting process in the case where the user inputs a password;

Fig. 13 is a flowchart for an access protecting process in which the user certainly needs the password inputting operation;

Figs. 14A and 14B are block diagrams of an optical disk drive to which the invention is applied;

Fig. 15 is an explanatory diagram of an internal structure of an apparatus in which an MO cartridge has been loaded;

Fig. 16 is a functional block diagram of an embodiment of the invention in which a password has been preserved in only a removable medium;

Fig. 17 is an explanatory diagram for an access protecting process for capturing an access permission by a default input password without inputting a password to an MO drive by the user;

Fig. 18 is an explanatory diagram of a password rewriting process to inhibit an access by a default input password;

Fig. 19 is a functional block diagram of an

embodiment of the invention in which a password has been preserved in an MO drive main body;

Fig. 20 is a functional block diagram of an embodiment of the invention in which a password has been separately preserved in the MO drive main body and  
5 a removable medium;

Fig. 21 is a functional block diagram of another embodiment of the invention in which a password has been separately preserved in the MO drive main body and  
10 the removable medium;

Fig. 22 is a flowchart for an access protecting process in the case where there is no password input by the user in the MO drive;

Fig. 23 is a flowchart for a validity term managing process in Fig. 21 for counting the number of using times by a counter and managing a term of a default input password; and  
15

Fig. 24 is a flowchart for the validity term managing process in Fig. 21 for setting and managing a time serving as a term of the default input password.  
20

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[Storing apparatus of fixed medium]

Fig. 1 is a block diagram of a hard disk drive (HDD) to which a password protection using a default input password of the invention is applied. In the hard disk drive, a magnetic disk medium is fixedly  
25

built in a drive main body. The hard disk drive is constructed by an enclosure 10 and a control board 12. The enclosure 10 has a head IC circuit 14 and four head assemblies 16-1 to 16-4 are connected thereto in the embodiment. Each of the head assemblies 16-1 to 16-4 has a recording head using an inductive head and a reproducing head using an MR head or the like. The enclosure 10 also has a VCM 18 for driving a head actuator and a spindle motor 20 for rotating a disk medium. For the head IC circuit 14 in the enclosure 10, a write channel circuit 28 and a read channel circuit 26 are provided on the control board 12 side. A hard disk controller 24 is provided for the write channel circuit 28 and the read channel circuit 26. A formatter, an ECC circuit, and the like are built in the hard disk controller 24. The hard disk controller 24 is connected to an interface circuit 36. The supply of write data from a host serving as an upper apparatus and the transfer of read data to the host are executed by a data transmission from/to the host side. As an interface circuit 36, a proper interface such as SCSI interface, ATA interface, ATAPI interface, SCSI, or the like can be used. In the embodiment, a constant density recording system (ZCDR) by a zone division is used as a recording system of a disk medium. Cylinders of the disk medium are divided into zones every predetermined number of cylinders and different

frequencies have been preset for respective zones. For this purpose, a PLL circuit 30 functioning as a frequency synthesizer is provided. By setting a corresponding zone frequency from a cylinder address upon reading or writing operation, clocks are supplied to the write channel circuit 28 and read channel circuit 26. The whole control of the hard disk drive is performed by an MCU (main control unit) 22. The hard disk controller 24 and interface circuit 36 are connected to the MCU 22 via a bus and, further, an RAM 38 functioning as a work memory and a flash ROM 40 functioning as a non-volatile memory are connected. The MCU 22 receives and decodes various commands from the host, instructs the hard disk drive to perform an ordinary reading or writing operation by an ordinary command, and instructs a servo controller 34 to execute a head positioning control by the VCM 18 provided for the enclosure 10. In order to execute the head positioning control by the driving of the VCM 18, a servo demodulating circuit 32 and the servo controller 34 are provided. In the embodiment, as servo information of the disk medium, a data surface servo system is used. Therefore, servo information is separated from a reproduction signal for the read channel circuit 26 and head position information is reconstructed by the servo demodulating circuit 32.

Fig. 2 is a functional block diagram for access



protection according to the invention using a password which is realized by a program control of the MCU 22 provided for the control board 12 in Fig. 1. As an external storing apparatus for a host system 42 serving  
5 as an upper apparatus, a hard disk drive 44 is connected. The non-volatile memory 40 in the hard disk drive 44 has a password preserving area 45 in the embodiment. In the password preserving area 45, a default input password (DPW) 60, a write/read password  
10 (PA0) 62, and a read only password (PA1) 64 are preserved. The work memory 38 using an RAM has a user input password storing area 65 for storing a user input password (UPW) 66. The write/read password 62 and read only password 64 stored in the non-volatile memory 40  
15 are passwords for access protection for permitting an access determined by each password when a password collation coincidence is obtained as a result of the collation with the user input password 66 inputted by the user from the upper apparatus. That is, when the  
20 collation coincidence with the user input password 66 is obtained, the write/read password 62 permits a write access by an ordinary write command or a read access by an ordinary read command to a disk medium 52. On the contrary, when the collation coincidence with the user  
25 input password 66 is obtained, the read only password 64 permits only the read access to the disk medium 52 by the ordinary read command. That is, the write/read

password 62 and read only password 64 have a password  
function for determining the kind of access  
simultaneously with the access protection. Although  
the access protection using the write/read password 62  
5 and read only password 64 for access protection is the  
same as the conventional access protection using a  
password, in addition, the default input password 60 is  
newly preserved in the invention.

The default input password 60 is a password for  
10 permitting an access to the disk medium 52 in the hard  
disk drive 44 even if the user input password 66 is not  
received from the host system 42 serving as an upper  
apparatus. Specifically, when there is no password  
input from the host system 42 serving as an upper  
15 apparatus by the user at the start of the use of the  
hard disk drive 44, the default input password 60  
preserved in the non-volatile memory 40 is regarded as  
a user input password 66 and is collation compared with  
the write/read password 62 and read only password 64  
20 serving as passwords for access protection. By the  
collation comparison, for example, when the default  
input password 60 coincides with the write/read  
password 62, the write access and read access by the  
ordinary commands are permitted as access kinds which  
25 are designated by the write/read password 62. In order  
to perform the access protection using the default  
input password 60, the hard disk drive 44 has a command

processing unit 46, a password verifying unit 48, and an access executing unit 50. The command processing unit 46 receives and decodes a command from the host system 42 serving as an upper apparatus and executes a necessary process. For example, at the start of the use of the apparatus, when the user inputs a password, the password inputted by the user is sent to the hard disk drive 44 by a password transfer command. The password transferring command is decoded by the command processing unit 46 and the user input password 66 acquired as a command parameter is written into the user input password storing area 65 in the work memory 38. The command processing unit 46 also has a password rewriting unit 54. The default input password 60, write/read password 62, and read only password 64 stored in the non-volatile memory 40 can be rewritten and changed by a password rewriting dedicated command which is supported by an interface for the host system 42 serving as an upper apparatus. As a password rewriting command, for example, in case of the SCSI interface, a format command, a vendor unique command, or the like can be used. The password verifying unit 48 has a password collating unit 56 and an accessing mode setting unit 58. At the start of the use of the hard disk drive 44, the password collating unit 56 first reads out the default input password 60 from the non-volatile memory 40 and writes it into the user

input password storing area 65 in the work memory 38.  
Consequently, at the start of the use of the apparatus,  
a value of the default input password 60 is first set  
as a user input password 66. As processes after the  
5 default input password 60 was written as a user input  
password 66 into the user input password storing area  
65 in the work memory 38, there are the following two  
processes.

- I. a process for executing a password collation  
10 without waiting for a password input by the user
- II. a process for waiting for an executing operation  
for the password input by the user and  
executing a password collation

In the process which does not wait for the  
15 password input by the user, when the writing of the  
default input password 60 into the user input password  
storing area 65 in the work memory 38 is finished, the  
user input password 66 is read from the work memory 38,  
the write/read password 62 is read out from the non-  
20 volatile memory 40, and the passwords 66 and 62 are  
collated with each other. When the collation  
coincidence is obtained by the password collation, an  
accessing mode which is determined by the write/read  
password 62 is set by the accessing mode setting unit  
25 58 and a permitting state of the write access by the  
ordinary write command and the read access by the read  
command from the host system 42 serving as an upper

apparatus is established for the access executing unit 50. On the other hand, in the process which waits for the password input operation by the user from the host system 42 serving as an upper apparatus, after the

5 default input password 60 was written into the user input password storing area 65 in the work memory 38 by the password collating unit 56, the apparatus waits for the reception of the password transfer command from the host system 42 serving as an upper apparatus. When the

10 password transfer command is received by the command processing unit 46, the password received as a command parameter is overwritten into the user input password storing area 65 in the work memory 38. The user input password 66 after overwriting and the write/read

15 password 62 in the non-volatile memory 40 are read out and collated by the password collating unit 56. When the collation coincidence is obtained, the writing/reading mode is set as an accessing mode by the accessing mode setting unit 58. In this case, in the

20 invention, with respect to the case where the user does not input a character train of the password and executes the password input in the host system 42 serving as an upper apparatus while an input column of the password is left vacant, even if the character

25 train of the user input password is not substantially received, the access permitting state based on the default input password 60 is established. That is,

even if the command processing unit 46 receives the password transfer command from the upper apparatus, when the character train of the password as a command parameter is a space character train, the password collating unit 56 reads out the user input password 66 which has already been rewritten to the default input password 60 and collates it with the write/read password 62 in the non-volatile memory 40. When the collation coincidence is obtained, the writing/reading mode is set as an accessing mode by the accessing mode setting unit 58. As the contents of an apparatus use start timing when the password verifying unit 48 in the hard disk drive 44 executes the access protection based on the default input password 60 in the non-volatile memory 40, there are the following timings.

- I. when the power source of the hard disk drive 44 is turned on,
- II. when a command is reset by an interface with the host system 42 serving as an upper apparatus,
- III. when the hard disk drive 44 enters a serious error state and is recovered by an internal reset,

and the like.

Fig. 3 shows a processing operation of the access protection which does not require the password input of the user in Fig. 2. The default input password 60,

write/read password 62, and read only password 64 preserved in the non-volatile memory 40 in Fig. 2 have been initialized to a predetermined specific value, for example, all "0" when the hard disk drive 44 is

5 initialized in a low level format. The hard disk drive 44 in Fig. 3 has the default input password 60 and write/read password 62 which are in the initializing state and each password is equal to "00000000h" in hexadecimal. The read only password 64 in Fig. 2 which

10 is not shown in Fig. 3 is also equal to "00000000h". When it is assumed that the power source of the hard disk drive 44 is turned on in such a state where the default input password 62 and write/read password 62 are preserved by the same value by the initialization,

15 on the hard disk drive 44 side, the password verifying unit 48 in Fig. 2 first reads out the default input password 60 and executes a writing process 70 for writing the default input password 60 as a user input password 66 into the user input password storing area

20 65 in the vacant state. Subsequently, the user input password 66 in which the value of the default input password 60 has been written and the write/read password 62 are read out and a collation comparing process 72 is executed. In this case, the user input

25 password 66 has the same value as that of the write/read password 62 by the writing process 70 using the default input password 60. When the collation

coincidence is obtained, an access permission 74 which provides the writing/reading mode is performed. The case where the value of each of the default input password 60 and write/read password 62 is equal to "00000000h" by the initialization has been described here as an example. After the hard disk drive 44 established the access permission and the write and/or read access was permitted, the values of the default input password 60, write/read password 62, and further, read only password 64 can be rewritten to other values by a password rewriting command from the upper interface. Further, the value of the read only password 64 can be rewritten to another value. The rewriting of the passwords is executed by the password rewriting unit 54 in the command processing unit 46 in Fig. 2.

Fig. 4 shows a password rewriting process by the password rewriting unit 54 in Fig. 2. A rewriting command of the write/read password (access protection password) 62 is first issued from the host system 42 side serving as an upper apparatus. The rewriting command of the write/read password 62 is, for example, [Change Password "0F1E2D3C"]. By the rewriting command, the value "00000000h" of the write/read password 62 in Fig. 3 is rewritten to "0F1E2D3Ch" by a rewriting process 76 in Fig. 4. When the write/read password 62 is rewritten as mentioned above, to



establish the access permission which does not need the password input by the user, the default input password 60 is also rewritten to the same value as the write/read password 62. The rewriting command of the default input password 60 is, for example, [Change Default Psw "0F1E2D3C"] and the default input password 60 is rewritten to the same value as the write/read password 62 by a rewriting process 78. The access protection password can be also rewritten in association with the default input password which has been set.

After the default input password 60 and write/read password 62 as an access protection password were rewritten to the other values, when the use of the hard disk drive 44 is restarted, even if the user does not input the password by the host system 42 serving as an upper apparatus, the value of the default input password 60 is written as a user input password 66 by a writing process 80. When a collation comparing process 82 between the user input password 66 in which the default input password 60 has been written and the write/read password 62 is executed next, since the passwords coincide with each other, an access permission 84 of the write/read access is established. It will be obviously understood that if the user wants to inhibit the access when a correct password is not inputted, it is sufficient to rewrite either one of the

default input password 60 and write/read password 62  
which have been set to all "0" due to the  
initialization in Fig. 3 to another value. When the  
default input password 60 and write/read password 62  
5 are different, dissidence is obtained by the collation  
coinciding process, so that the access permission  
cannot be obtained. The access permission can be  
established only by the password input by the user  
which coincides with the write/read password 62.

10 Fig. 5 shows an accessing mode and access contents  
of the hard disk drive 44 which are established by the  
accessing mode setting unit 58 provided for the  
password verifying unit 48 in Fig. 2. That is, the  
accessing mode comprises three modes of a  
15 writing/reading mode, a read only mode, and a security  
mode. In the writing/reading mode, the ordinary read  
command and write command are accepted. A change of  
the default input password, write/read password, and  
read only password is also permitted. In the read only  
20 mode, only the ordinary read command is accepted. In  
this case as well, a change of the default input  
password, write/read password, and read only password  
is permitted. Further, in the security mode, although  
the access by the ordinary read command and write  
25 command is perfectly inhibited, the read command or  
write command accompanied with the password input is  
accepted. It will be obviously understood that the

access for each command is permitted for the first time when the password collation coincidence is obtained.

The embodiment of Fig. 2 relates to the case where the default input password 60, write/read password 62, and read only password 64 have been preserved in the non-volatile memory 40 of the hard disk drive 44. However, as another embodiment of the invention, all of the passwords can be stored in the magnetic disk medium 52 or can be also separately preserved into the non-volatile memory 40 and magnetic disk medium 52 of the hard disk drive 44.

Fig. 6 shows a preserving mode of the password in the hard disk drive 44 of the invention. A preserving mode 1 relates to the embodiment of Fig. 2 and both of the default input password and the password for access protection are stored on the hard disk drive 44 side. A preserving mode 2 relates to the case where all of the default input password and the password for access protection are stored in the magnetic disk medium 52. A preserving mode 3 relates to the case where the default input password is stored on the hard disk drive 44 side and the password for access protection is stored on the magnetic disk medium 52 side. Further, a preserving mode 4 relates to the case where the default input password is preserved in the magnetic disk medium 52 and the password for access protection is stored in the hard disk drive 44. The preserving modes 2, 3, and

4 will now be specifically explained with reference to Figs. 7, 9, and 10.

Fig. 7 shows the preserving mode 2 in Fig. 6. The default input password 60, write/read password 62, and read only password 64 are preserved in a password storing area 68 of the magnetic disk medium 52. Therefore, at the start of the use of the hard disk drive 44, the password verifying unit 48 reads out the default input password 60, write/read password 62, and read only password 64 from the magnetic disk medium 52 via the access executing unit and develops them into a password storing area 67 in the work memory 38. The user input password storing area 65 to store the user input password 66 is assured in the work memory 38.

Fig. 8 shows a password preserving state of the magnetic disk medium 52 in Fig. 7. In the embodiment, since a logical block address LBA = 1 of the magnetic disk medium has been allocated to a disk managing area 71 which cannot be accessed by the ordinary read command or write command, the password storing area 68 is assured as a dedicated area in the disk managing area 71. The default input password 60, read only password 64, and write/read password 62 are preserved in the password storing area 68.

Fig. 9 relates to the preserving mode 3 in Fig. 6. The default input password 60 is preserved in the password preserving area 45 assured in the non-volatile

memory 40 serving as a hard disk drive 44 side. On the other hand, the write/read password 62 for access protection and read only password 64 are preserved in the password storing area 68 of the magnetic disk medium 52. Therefore, the password storing area 67 is assured in the work memory 38. At the start of the use of the hard disk drive 44, the password verifying unit 48 first reads out the write/read password 62 and read only password 64 from the password storing area 68 of the magnetic disk medium 52 through the access executing unit 50 and develops them into the work memory 38. Obviously, the user input password storing area 65 to store the user input password 66 is also assured in the work memory 38.

Fig. 10 relates to the preserving mode 4 in Fig. 6. In the embodiment, the default input password 60 is preserved in the password storing area 68 of the magnetic disk medium 52. On the other hand, the write/read password 62 for access protection and read only password 64 are preserved in the password preserving area 45 provided in the non-volatile memory 40 of the hard disk drive 44. The password storing area 67 is assured in the work memory 38. At the start of the use of the hard disk drive 44, the password verifying unit 48 first reads out the default input password 60 from the password storing area 68 of the magnetic disk medium 52 through the access executing

unit 50 and develops it into the work memory 38 as shown in the diagram. Processing functions of the command processing unit 46, password verifying unit 48, access executing unit 50, password rewriting unit 54, password collating unit 56, and accessing mode setting unit 58 provided in the hard disk drive 44 in each of the preserving modes 2, 3, and 4 in Figs. 7, 9, and 10 are the same as those in the embodiment of the preserving mode 1 in Fig. 2.

Fig. 11 is a flowchart for an access protecting process in which the password input by the user is unnecessary in the access protection of the invention for the hard disk drive 44 as a target. This process will now be described with respect to the embodiment of the preserving mode 1 in Fig. 2 as an example. When the use of the hard disk drive 44 is started in response to the turn-on of the power source of the hard disk drive 44, a reset command of the interface during the operation, further, an internal reset from a serious error, or the like, first in step S1, a setting process for reading out the default input password 60 and writing into the user input password storing area 65 is executed. In step S2, the user input password 66 rewritten to the default input password 60 and the write/read password 62 are compared and collated. In this instance, as shown in Fig. 3, if the user input password 66 and write/read password 62 are set to the

same value, the collation coincidence is obtained in  
step S3. The writing/reading mode is established in  
step S6. In step S3, when the user input password 66  
rewritten by the default input password 60 does not  
5 coincide with the write/read password 62, the read only  
password 64 is compared and collated with the user  
input password 66 rewritten by the default input  
password 60 in step S4. As a result of the comparison  
collation, when the collation coincidence is obtained  
10 in step S5, the read only mode is set in this case in  
step S7. When the collation dissidence is obtained  
even in step S5, the processing routine advances to the  
security mode in step S8. The access by the ordinary  
read command or write command is perfectly inhibited  
15 and only the access in response to the password input  
by the user is accepted.

Fig. 12 is a flowchart for an access protecting  
process in the case where the user inputs a password.  
The process in the case where the user inputs the  
20 password is executed so long as there is the password  
input by the user at any one of the proper timings  
corresponding to a state where the processing routine  
enters the security mode in step S8 in Fig. 11, the  
case where the user inputs the password at the time of  
25 the start of the use of the apparatus, and further,  
during the operation. First, when a password transfer  
command in association with the password input by the

user is received, in step S1, the password inputted by the user is set as a user input password 66 into the user input password storing area 65 in the work memory 38. In step S2, the user input password 66 and  
5 write/read password 62 are compared and collated. When the collation coincidence is obtained in step S3, the writing/reading mode is set in step S6. If they do not coincide, the user input password is compared and collated with the read only password in step S4. If  
10 the collation coincidence is obtained in step S5, the read only mode is set in step S7. When the collation dissidence is obtained even in step S5, the security mode is set in step S8 and the access by the ordinary command is completely inhibited.

15 Fig. 13 is a flowchart for another embodiment of the access protection of the invention for the hard disk drive 44 as a target. In the flowchart, the password inputting operation by the user is certainly necessary. The processes in Fig. 13 will now be  
20 described as follows with regard to the embodiment of the preserving mode 1 in Fig. 2 as an example. When the use of the apparatus is started by the turn-on of the power source of the hard disk drive 44 or the like, first in step S1, the default input password 60 is read  
25 out and set as a user input password 66 into the user input password area 65. In step S2, the apparatus waits for the password input of the user. When the



password transfer command is received by the execution of the password inputting operation of the user, the presence or absence of the password input by the user is discriminated. The processing routine advances to

5 step S3 and a check is made to see if the password inputted by the user is a vacant character train. If the character train has been normally stored in the password inputted by the user, step S4 follows and the password inputted by the user is overwritten into the

10 user input password area 65. When the password inputted by the user is the vacant character train, the overwriting in step S4 is not performed. The value of the default input password 60 written in step S1 is left as it is as a user input password 66. In step S5,

15 the user input password 66 and write/read password 62 are compared and collated. If the collation coincidence is obtained in step S6, the writing/reading mode is set in step S9. When the collation dissidence is obtained, the user input password 66 and read only

20 password 62 are compared and collated in step S7. When the collation coincidence is obtained in step S8, the read only mode is set in step S10. When the collation dissidence is derived, the security mode is set in step S11 and the access by the ordinary command is

25 inhibited. In the processes of Fig. 13, in the case where the user does not input a character train of the password but executes only the executing operation of

the password input, the vacant character train of the password inputted by the user is recognized and the comparison collation using the default input password in place of the user input password is executed.

5 Substantially, the user can establish the accessible state of the hard disk drive 44 without needing the character train of the password.

[Storing apparatus of the removable medium]

10 Figs. 14A and 14B are circuit block diagrams of a magneto optic disk drive as a storing apparatus using a removable medium to which the invention is applied. The embodiment can be obviously applied as it is to a changeable storing apparatus such as removable magnetic  
15 disk, phase change type optical disk, or the like. The optical disk drive is constructed by a control board 110 and an enclosure 111. The control board 110 comprises: an MCU 112 to perform a whole control of the magneto optic disk drive; an RAM 106 serving as a work  
20 memory; a flash ROM 108 serving as a non-volatile memory; an interface 117 for transmitting and receiving commands and data to/from an upper apparatus; a magneto optic disk controller (ODC) 114 to perform processes which are necessary to write and read data  
25 to/from the optical disk medium; a DSP 116; and a buffer memory 118. A formatter 114-1 and an ECC processing unit 114-2 are provided for the magneto optic

disk controller 114. At the time of the write access, the formatter 114-1 divides NRZ write data on a sector unit basis of the medium and forms a recording format. The ECC processing unit 114-2 forms and adds an ECC  
5 code on a sector write data unit basis and, further, forms and adds a CRC code as necessary. Moreover, the sector data after completion of the ECC encoding is converted into, for example, a 1-7 RLL code. At the time of the read access, the demodulated sector read  
10 data is inversely converted from the 1-7 RLL code and is subjected to a CRC check by the ECC processing unit 114-2. After that, error detection and correction are performed. In addition, the NRZ data of the sector unit is coupled by the formatter 114-1, thereby forming  
15 a stream of the NRZ read data and transferring it to the upper apparatus. A write LSI circuit 120 is provided for the optical disk controller 114. A write modulating unit 121 and a laser diode control unit 122 are provided for the write LSI circuit 120. A control  
20 output of the laser diode control unit 122 is supplied to a laser diode unit 130 provided on the enclosure 111 side. The laser diode unit 130 integrally has a laser diode 130-1 and a detector 130-2 for monitoring. The write modulating unit 121 converts the write data  
25 into a data format of the PPM recording or PWM recording. A magneto-optic storage medium is used as a removable medium to perform the recording and

reproduction by using the laser diode unit 130. A recording format of the medium is the zone CAV.

Further, as a recording system of the medium, the pit position recording (PPM) recording to record data in correspondence to the presence or absence of a mark on the medium or a pulse width recording (PWM recording) to make the edges of the mark, namely, a leading edge and a trailing edge correspond to the data is used.

When an MO cartridge medium is loaded into the optical disk drive, an ID portion of the medium is first read, the kind of medium is recognized by the MCU 112 from a pit interval, and a recognized result of the kind is notified to the write LSI circuit 120. The sector write data from the optical disk drive 114 is converted into PWM recording data by the write modulating unit 121. The PWM recording data converted by the write modulating unit 121 is supplied to the laser diode control unit 122 and is written to the medium by the light emission driving of the laser diode 130-1. A read LSI circuit 124 is provided as a reading system for the optical disk drive 114. A read demodulating unit 125 and a frequency synthesizer 126 are built in the read LSI circuit 124. A photosensing signal of the medium return light of the laser beam from a detector 132 for ID/MO is inputted as an ID signal and an MO signal to the read LSI circuit 124 through a head amplifier 134. Circuit functions of an AGC circuit, a

filter, a sector mark detecting circuit, and the like are provided for the read demodulating unit 125 of the read LSI circuit 124. A read clock and read data are formed from the inputted ID signal and MO signal. The

5 PWM recording data is demodulated to the original NRZ data. Since the zone CAV is used as a control system of a spindle motor 140, a setting control of a frequency dividing ratio to generate a clock frequency corresponding to the zone is performed from the MCU 112

10 to the frequency synthesizer 126 having the read LSI circuit 124 therein. The frequency synthesizer 126 is a PLL circuit having a programmable frequency divider and generates a reference clock having a predetermined peculiar frequency as a read clock in accordance with

15 the zone position of the medium. The read data demodulated by the read LSI 124 is supplied to the magnetooptic disk controller 114. After completion of the inverse conversion of the 1-7 RLL code, the read data is subjected to the CRC check and the ECC process

20 by an encoding function of the ECC processing unit 114-2. The NRZ sector data is reconstructed and coupled to the stream of the NRZ read data by the formatter 114-1. After that, the resultant data is transferred to the upper apparatus by the upper interface 117 via a buffer

25 memory 118.

A detection signal of a temperature sensor 136 provided on the enclosure 111 side is supplied to the

MCU 112 via the DSP 116. On the basis of an environmental temperature in the apparatus, each of the light emitting powers for reading, writing, and erasing in the laser diode control unit 122 is controlled to the optimum value. The MCU 112 controls the spindle motor 140 by a driver 138 through the DSP 116, thereby allowing the disk to rotate at a constant velocity of, for example, 6000 r.p.m. The MCU 112 supplies a current from the DSP 116 to an electromagnet provided on the enclosure 111 side through a driver 142, thereby applying a recording magnetic field to the medium. The DSP 116 has a servo function to position the beam from the laser diode unit 130 for the medium and executes a seek control for seeking the optical head to a target track so as to obtain an on-track state. The seek control can be simultaneously executed in parallel with the write access or read access in response to an upper command by the MCU 112. To realize the servo function of the DSP 116, a detector 145 for FES to receive the beam return light from the medium is provided for the optical unit on the enclosure 111 side. An FES detecting circuit (focusing error signal detecting circuit) 146 forms a focusing error signal E1 from a photosensing output of the detector 145 for FES and supplies it to the DSP 116. A detector 147 for TES to receive the beam return light from the medium is provided for the optical unit on the enclosure 111

side. A TES detecting circuit (tracking error signal  
detecting circuit) 148 forms a tracking error signal E2  
from a photosensing output of the detector 147 for TES  
and supplies it to the DSP 116. The tracking error  
5 signal E2 is inputted to a TZC detecting circuit (track  
zero-cross point detecting circuit) 150, by which a  
track zero-cross pulse E3 is formed and inputted to the  
DSP 116. A lens position sensor 154 to detect the lens  
position of an objective lens for irradiating the laser  
10 beam to the medium is provided on the enclosure 111  
side. A lens position detection signal (LPOS) E4 is  
inputted to the DSP 116. Further, to control the  
position of the beam spot on the medium, the DSP 116  
controls a focusing actuator 160, a lens actuator 164,  
15 and a VCM 168 through drivers 158, 162, and 166,  
respectively.

An outline of the enclosure 111 in the optical  
disk drive is as shown in Fig. 15. The spindle motor  
140 is provided in a housing 167. A loading such that  
20 by inserting an MO cartridge 170 from an inlet door 169  
side to a hub of a rotary shaft of the spindle motor  
140, an internal MO medium 172 is attached to a hub of  
the rotary shaft of the spindle motor 140 is performed.  
A carriage 176 which is movable in the direction which  
25 traverses the medium tracks by the VCM 168 is provided  
under the MO medium 172 of the loaded MO cartridge 170.  
An objective lens 180 is mounted on the carriage 176.

A beam from a laser diode provided for a fixed optical system 178 is inputted to the objective lens 180 through a prism 181, thereby forming a beam spot onto the medium surface of the MO medium 172. The objective lens 180 is moved in the optical axial direction by the focusing actuator 160 provided in the enclosure 111 in Figs. 14A and 14B and can be moved in a range of, for example, tens of tracks in the radial direction which traverses the medium tracks by the lens actuator 164. It is also possible to construct such that the lens actuator 164 is not provided but the tracking control is performed by only the movement of the carriage 176 by the VCM 168.

Fig. 16 shows an embodiment of the access protection by using the default input password of the invention for the optical disk drive in Figs. 14A and 14B as a target. The embodiment is characterized in that the default input password, write/read password, and read only password are preserved in the storage medium in accordance with the preserving mode 1 in Fig. 6. In Fig. 17, a password storing area 182 is provided in an area which cannot be read out by the ordinary command of the MO medium 172. The default input password 60, write/read password 62, and read only password 64 are stored in the password storing area 182. A user input password storing area 202 is provided in the work memory 106. The user input



password 66 is stored in the user input password  
storing area 202. When the MO cartridge 170 is  
inserted into an optical disk drive 90, the default  
input password 60, write/read password 62, and read  
5 only password 64 are read out and stored into a  
password storing area 200 in the work memory 106 as  
shown in the diagram and are subjected to an access  
protecting process by a command processing unit 92, a  
password verifying unit 94, and an access executing  
10 unit 96. For the access protection using the default  
input password, the command processing unit 92,  
password verifying unit 94, and access executing unit  
96 are provided for the optical disk drive 90. The  
password verifying unit 94 has a password collating  
15 unit 100 and an accessing mode setting unit 102. A  
password rewriting unit 98 is provided for the command  
processing unit 92. Such a construction on the driving  
side is fundamentally the same as that in the  
embodiment of Fig. 2 for, for example, the hard disk  
20 drive as a target. However, further, in the optical  
disk drive 90 using the MO cartridge 170 having the MO  
medium 172 as a removable medium, a validity term  
managing unit 104 is newly provided for the password  
verifying unit 94. The validity term managing unit 104  
25 manages a term when the default input password 60 is  
validly used. If a validity term which has been preset  
in the MO medium 172 or optical disk drive 90 expired,

the default input password 60 is forcedly rewritten to a different value. Consequently, in the validity term, even if the default input password 60 is the same as the write/read password 62, if the validity term  
5 expired, the default input password is changed to a value different from the write/read password 62, namely, a value corresponding to the EX-OR with a hexadecimal value "3F231200", so that the access of the optical disk drive 90 in which the password is not  
10 inputted is inhibited. On the contrary, when a predetermined period of time elapses, the default input password 60 is loaded so as to be rewritten in accordance with a certain rule. A value such that when the default input password is rewritten by this rule,  
15 it is equalized to, for example, the write/read password 62 serving as an access protection password is set as a rewrite value. With this method, the apparatus can be used by a method such that when the predetermined period of time elapses, the access can be  
20 performed without inputting any password.

Fig. 17 shows a processing operation of the access protection which does not need a password input of the user in the optical disk drive 90 in Fig. 16. The MO disk 172 has already been initialized at a time point  
25 when the apparatus is shipped out from the manufacturer of the medium. A hexadecimal value "CF23CF23h" as an initial value when the MO cartridge 170 is initialized

has been stored in the default input password 60,  
write/read password 62, and read only password 64.  
Therefore, when the use of the optical disk drive is  
started in the preserving state of the initialized  
5 passwords, the default input password 60 is first read  
out and written into the user input password storing  
area 202 as a user input password 66 by a writing  
process 184. Subsequently, a collation comparing  
process 186 of the user input password 66 in which the  
10 default input password 60 has been written and the  
write/read password 62 is executed. When a collation  
coincidence is obtained, an access permission 188,  
namely, the writing/reading mode is set. Therefore,  
even in the optical disk drive 90 in Fig. 16, the user  
15 can establish an access permitting state of the MO  
cartridge 170 without needing the password input.

Fig. 18 shows a case where the password is  
rewritten in the state of the writing/reading mode in  
which the access permission based on the default input  
20 password has been established as shown in Fig. 17. In  
the password rewriting, the initial value "CF23CF23h"  
of the default input password 60 in Fig. 17 is  
rewritten to another value "AB89AB89h" by a rewriting  
process 192 based on a password rewriting command 190.  
25 If the default input password 60 is rewritten to  
another value as mentioned above, when the use of the  
optical disk drive 90 is started, unless the user

inputs a password, the user input password 66 is first  
rewritten to a value "AB89AB89h" of the default input  
password 60 after the change by a writing process 194.  
Subsequently, a collation comparing process 196 between  
5 this value and the value "CF23CF23h" of the write/read  
password 62 is executed. In this case, since a  
collation dissidence is obtained, an access inhibition  
198, namely, the security mode is set.

The rewriting of the default input password 60 as  
10 shown in Fig. 19 is effective in the following case.  
First, the authorized inherent user Mr. A of the  
optical disk drive 90 requests a secretary Mr. B to  
perform a process in a state where the default input  
password 60 and write/read password 62 are set to the  
15 same initial value "CF23CF23h" as shown in Fig. 17.  
Mr. B who received the request turns on the power  
source, so that the reading/writing mode by the access  
permission based on the default input password 60 is  
established even if he does not know the password. He  
20 can execute the process using the optical disk drive  
90. The inherent user Mr. A preliminarily requests Mr.  
B, whom Mr. A requested the work, to input a password  
rewriting command (Change Default Psw "AB89AB89") if he  
finished the work. Mr. B who received the request  
25 inputs the command instructed from Mr. A if the work  
was finished. When the command is inputted, the  
default input password 60 is rewritten to "AB89AB89h"

as shown in Fig. 18. Therefore, Mr. B who received the request from the inherent user Mr. A and performed the work finishes the work, rewrites the default input password 60, and executes an ejecting operation of the MO cartridge 170. Thus, in response to an instruction in association with the ejecting operation, the default input password 60, write/read password 62, and read only password 64 developed in the work memory 106 are written back to the password storing area 182 of the MO cartridge 170. After that, the MO cartridge 170 is ejected. Therefore, after the MO cartridge 170 was ejected, even if the MO cartridge 170 is again inserted into the optical disk drive 90, the default input password 60 which is read out and stored into the work memory 106 at this time is changed to a value different from the write/read password 62 as shown in Fig. 18. Unless the value of the write/read password 60 is inputted as a password, the access to the MO cartridge 170 can be perfectly inhibited. That is, the inherent user Mr. A instructs Mr. B to input a default input password rewriting command after the end of the work, thereby constructing in a manner such that after Mr. B finished the work, even if Mr. B as well as the third person turns on the power source in order to use the optical disk drive 90 of Mr. A, unless he inputs the password "CF23CF23h" which is known for only the inherent user Mr. A, the optical disk drive 90 enters

the security mode and the access can be completely inhibited.

Fig. 19 shows an embodiment of the optical disk drive 90 corresponding to the preserving mode 1 in Fig.

5 6. This embodiment is characterized in that the default input password, write/read password, and read only password are preserved on the drive main body side. The password storing area 200 is provided in the non-volatile memory 108 of the optical disk drive 90.

10 The default input password 60, write/read password 62, and read only password 64 are stored in the password storing area 200. The user input password storing area 202 is provided in the work memory 106. The user input password 66 is stored in the user input password

15 storing area 202. For the purpose of the access protection using the default input password, the command processing unit 92, password verifying unit 94, and access executing unit 96 are provided for the optical disk drive 90. The password verifying unit 94

20 has the password collating unit 100 and accessing mode setting unit 102. The password rewriting unit 98 is provided for the command processing unit 92. Further, the validity term managing unit 104 is newly provided for the password verifying unit 94.

25 Fig. 20 shows an embodiment of the optical disk drive 90 corresponding to the preserving mode 3 in Fig. 6. This embodiment is characterized in that the

default input password 60 is preserved in the password storing area 200 in the non-volatile memory 108 of the optical disk drive 90 and the write/read password 62 and read only password 64 are preserved in the password storing area 182 of the MO cartridge 170 as a removable medium. Therefore, when the MO cartridge 170 is inserted into the optical disk drive 90, the password verifying unit 94 first reads out the write/read password 62 and read only password 64 from the password storing area 182 of the MO cartridge 170 through the access executing unit 96 and develops them into the work memory 106.

Fig. 21 shows an embodiment of the optical disk drive 90 to which the preserving mode 4 in Fig. 6 is applied. In the preserving mode 4, the write/read password 62 for access protection and the read only password 64 are preserved in the password storing area 200 in the non-volatile memory 108 of the optical disk drive 90. The default input password 60 is preserved in the password storing area 182 of the MO cartridge 170. Therefore, when the MO cartridge 170 is inserted into the optical disk drive 90, the password verifying unit 94 reads out the default input password 60 from the MO cartridge 170 through the access executing unit 96 and develops it into a password storing area 204 in the work memory 106 as shown in the diagram.

Fig. 22 is a flowchart for the access protecting

process in the case where the user does not input a password in the optical disk drive 90. A case of the preserving mode 2 in Fig. 6 will now be described as an example. When the MO cartridge 170 is inserted into the optical disk drive 90, in step S1, the default input password 60 is read out and written and set as a user input password 66 into the user input password area. In step S2, the user input password 66 and write/read password 62 are compared and collated. When the collation coincidence is obtained in step S3, the writing/reading mode is set in step S6. When the collation dissidence is obtained, the user input password 66 and read only password 64 are compared and collated in step S4. When the collation coincidence is obtained in step S5, the read only mode is set in step S7. When the collation dissidence is obtained, the security mode is set in step S8 and the access which is not accompanied with the password is perfectly inhibited. When the writing/reading mode or reading mode is set in step S6 or S7, a term managing process by the validity term managing unit 104 provided in the password verifying unit 94 is executed in step S9.

Fig. 23 is a flowchart for an embodiment of the term managing process in step S9 in Fig. 22. In the term managing process, first in step S1, the presence or absence of the initialization of the default input password or the change by the command is discriminated.



When there is the initialization or change, the counter DPC is set to DPC = 0 in step S2. In step S3, a count value of the counter DPC is increased by "1". If there is not the initialization or change of the default input password, step S2 is skipped and the count value of the counter DPC is increased by "1" in step S3. In step S4, a check is made to see whether the count value of the counter DPC is equal to or larger than a specified value NXX which gives a predetermined validity term or not. When the value of the counter DPC is less than the specified value NXX, step S5 is skipped. However, when the value of the counter DPC is equal to or larger than the specified value NXX, step S5 follows and a random number train RX is generated in the optical disk drive 90. The exclusive OR between the value PD of the default input password and the random number train RX is obtained and is set to a value of the new default input password. That is, in the embodiment, the number of using times of the optical disk drive 90 is counted by the counter DPC. When the number of using times reaches the specified value NXX, the default input password is forcibly changed to a value which cannot be known by the user by using the random number train, thereby inhibiting the access permission in which the password is not inputted after the validity term.

Fig. 24 is a flowchart for another embodiment of

the term managing process of the default input password  
in step S9 in Fig. 22. In the term managing process,  
in step S1, the presence or absence of the  
initialization or change of the default input password  
5 is discriminated. If there is the initialization or  
change, the time of a predetermined validity term is  
set into the counter DPC in step S2. In step S3, a  
check is made to see if the present time is a time  
after the validity term set in the counter DPC. When  
10 the present time is the time after the time of the  
validity term of the counter DPC, step S4 follows. In  
a manner similar to the case of Fig. 23, the random  
number train RX is generated in the optical disk drive  
90 and is replaced by the exclusive OR between the  
15 random number train RX and the value PD of the default  
input password in this instance. The value of the  
default input password is forcedly changed to a  
different value and the access of the optical disk  
drive 90 irrespective of the password input after the  
20 validity term is perfectly inhibited. It is possible  
to set a using method such that when the present time  
is the time after the validity term of the counter DPC  
and the processing routine advances to step S5, the  
default input password 60 is changed to an access  
25 protection password, for example, the value which is  
equal to the write/read password 62, thereby making it  
possible to access even if the password is not inputted

after the elapse of a predetermined period of time. In the optical disk drive 90, the process in the case where the user does not input the password in the flowchart of Fig. 22 has been shown as an example.

5 However, the processes in the case where the user inputs the password are the same as those in the flowchart of Fig. 12 in the hard disk drive. The processes in the flowchart of Fig. 13 of the hard disk drive in which the user is allowed to certainly execute the password inputting operation can be also applied as  
10 they are to the optical disk drive 90.

As mentioned above, according to the invention, the default input password is stored on the apparatus side where it is protected by using the password, for  
15 example, on the storing apparatus side, and when there is no password input from the user, the default input password is regarded as a user input password and the verification of the password is performed. Therefore, by setting the default input password and the password  
20 for access protection to the same value, even if the user does not input any password, the access protection is cancelled and the access by the ordinary command can be performed. The password input by the user can be remarkably omitted.

25 In the case where the access has already been permitted in the storing apparatus, by enabling the default input password to be rewritten by the user, the

user can selectively use the access protection which does not need the password input and the access protection which needs the password input as necessary.

Further, the validity term of the default input password is managed and, when the present time exceeds the validity term, the default input password is forcedly changed to another value which cannot be known by the user. Thus, the accessible state of the storing apparatus in which the password input is omitted can be limitedly continued for only a predetermined period of time. A situation such that a defenseless state where the password input can be omitted continues for a long period of time can be prevented.

Although the above embodiment has been described with respect to the case where, for instance, the hard disk drive and optical disk drive are used as storing apparatuses, the invention obviously also incorporates other storing apparatuses such as magnetic tape drive and floppy disk drive. The invention is not limited to the storing apparatus but can be also applied as it is to an apparatus or a general system for performing the access protection by the password.

The invention incorporates other arbitrary modifications within a scope without losing the objects and advantages of the invention. Further, the invention is not limited by the numerical values shown in the embodiment.

WHAT IS CLAIMED IS:

1. A storing apparatus for protecting an access of information recorded on a medium by a password, comprising:

5 a password preserving unit for preserving a default input password and a password for access protection; and

10 a password verifying unit for controlling the access protection by substituting said default input password for a user input password and comparison collating with said password for access protection when there is no password input from the user and for controlling the access protection by comparison collating the user input password with said password  
15 for access protection when there is the password input from the user.

2. An apparatus according to claim 1, wherein in the case where a same value has been preserved in said  
20 default input password and said password for access protection by said password preserving unit, even if there is no password input by the user, said password verifying unit permits an access by substituting said default input password for the user input password and  
25 collating with the password for access protection.

3. An apparatus according to claim 1, wherein

said password preserving unit further has a user input password area to store the user input password, and

5       said password verifying unit is constructed in a manner such that

10       at the start of the use of the apparatus such as turn-on of a power source, command reset, error reset, further, medium insertion, or the like, said default input password is read out and written into said user input password area, an access permission or inhibition is subsequently established on the basis of a collation coincidence between the password in said user input password area and said password for access protection,

15       after the access permission was established, each time there is a password input of the user, the user input password is written into said user input password area and, subsequently, the access permission or inhibition is established on the basis of a collation coincidence between the password in said user input password area and said password for access protection.

4.    An apparatus according to claim 1, wherein

25       said password preserving unit further has a user input password area to store the user input password, and

      said password verifying unit is constructed in a manner such that

at the start of the use of the apparatus such as  
turn-on of a power source, command reset, error reset,  
further, medium insertion, or the like, the apparatus  
waits for the password input by the user in a state  
5 where said default input password is read out and  
written into said user input password area,

when there is the user password input, the user  
input password is overwritten into the default input  
password in said user input password area, and after  
10 that, the password in said user input password area and  
said password for access protection are collated and  
compared and the access protection is controlled, and

when there is no user password input and/or in the  
case where the password is an empty character train  
15 even if there is the user password input, the collation  
comparison between the default input password in said  
user input password area and said password for access  
protection is executed and the access protection is  
controlled.

20

5. An apparatus according to claim 1, wherein said  
password preserving unit preserves said default input  
password and said password for access protection into a  
non-volatile memory of an apparatus main body.

25

6. An apparatus according to claim 1, wherein  
said password preserving unit preserves said

default input password and said password for access protection into said medium, and

5       said password verifying unit reads out said default input password and said password for access protection from said medium and stores into an apparatus main body at the start of the use of the apparatus and controls the access protection.

10       7.    An apparatus according to claim 1, wherein said password preserving unit preserves said default input password into a non-volatile memory of an apparatus main body and preserves said password for access protection into the medium, and

15       said password verifying unit reads out said password for access protection from said medium and stores into the apparatus main body at the start of the use of the apparatus and controls the access protection.

20       8.    An apparatus according to claim 1, wherein said password verifying unit preserves said password for access protection into a non-volatile memory of an apparatus main body and preserves said default input password into the medium, and

25       a password processing unit reads out said default input password from said medium and stores into the apparatus main body at the start of the use of the



apparatus and controls the access protection.

9. An apparatus according to any one of claims 5 to  
7, wherein in said medium, a password preserving area  
5 to preserve said password is provided in a specific  
area which cannot be accessed by ordinary read command  
and write command.

10. An apparatus according to claim 1, further  
10 comprising a password rewriting unit for rewriting said  
default input password or said password for access  
protection on the basis of a dedicated command from an  
upper apparatus.

11. An apparatus according to any one of claims 5 to  
15 7, wherein said medium is a medium fixedly enclosed in  
the apparatus main body.

12. An apparatus according to any one of claims 5 to  
20 7, wherein said medium is a removable medium which is  
detachable for the apparatus main body.

13. An apparatus according to claim 1, wherein  
said password preserving unit preserves a  
25 plurality of kinds of passwords for access protection  
according to kinds of access protection, and  
said password verifying unit permits an access by

an ordinary command corresponding to the kind of said password for access protection in which a collation coincidence is obtained.

- 5      14. An apparatus according to claim 13, wherein  
         as said passwords for access protection, said  
password preserving unit preserves a write/read  
password to permit an access by a read command and a  
write command and a read only password to permit only  
10 an access by the read command, and  
         said password verifying unit permits the access by  
the ordinary write command or read command when the  
collation coincidence of said write/read password is  
obtained and permits the access by only the ordinary  
15 read command when the collation coincidence of said  
read only password is obtained.

15. An apparatus according to claim 1, further  
comprising a validity term setting unit for setting a  
20 validity term into said default input password.

16. An apparatus according to claim 15, wherein said  
validity term setting unit counts the number of using  
times of the apparatus by a counter and, when a value  
25 of said counter reaches a predetermined value, said  
validity term setting unit forcedly changes said  
default input password to a value different from the

default password so far.

17. An apparatus according to claim 15, wherein said validity term setting unit sets a time of a validity term and, when a present time in case of using the apparatus exceeds said validity term, said validity term setting unit forcedly changes said default input password to a value different from the default password so far.

18. A storing method of protecting information recorded on a medium from an access by a password, comprising:

a password preserving step of preserving a default input password and a password for access protection; and

a password verifying step of controlling the access protection by substituting said default input password for a user input password and comparison collating with said password for access protection when there is no password input from the user and for controlling the access protection by comparison collating said user input password with said password for access protection when there is the password input from the user.

19. A method according to claim 18, wherein in the

case where a same value has been preserved in said  
default input password and said password for access  
protection, in said password verifying step, prior to  
the password input of the user, a value of said default  
5 input password is copied to the user input password and  
is collated with said password for access protection,  
thereby permitting or inhibiting an access.

20. A method according to claim 18, wherein  
10 in said password preserving step, a plurality of  
kinds of passwords for access protection according to  
kinds of said access protection are preserved, and  
in said password verifying step, an access by an  
ordinary command corresponding to the kind of said  
15 password for access protection in which a collation  
coincidence is obtained is permitted.

21. A method according to claim 18, further comprising  
a validity term setting step of setting a validity term  
20 into said default input password.

A drive preserves a default input password. When there is no password input from the user, the default input password is regarded as a user input password and is compared and collated with a password for access protection, thereby controlling the access protection. In this instance, if the default input password and the password for access protection have the same value, a collation coincidence is obtained. The drive permits the access without needing a password input of the user.

A drive preserves a default input password. When there is no password input from the user, the default input password is regarded as a user input password and is compared and collated with a password for access protection, thereby controlling the access protection. In this instance, if the default input password and the password for access protection have the same value, a collation coincidence is obtained. The drive permits the access without needing a password input of the user.

FIG. 1

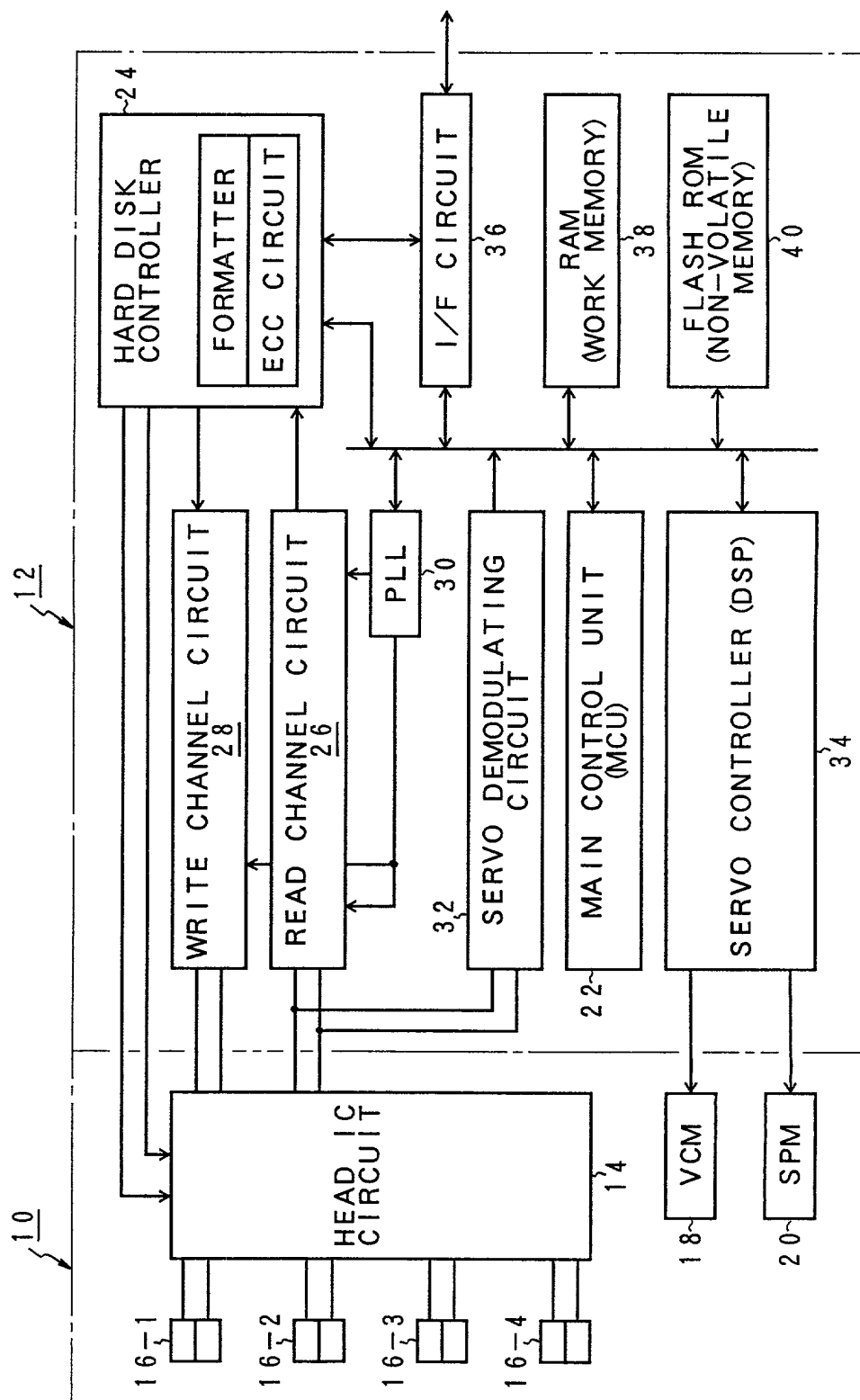


FIG. 2

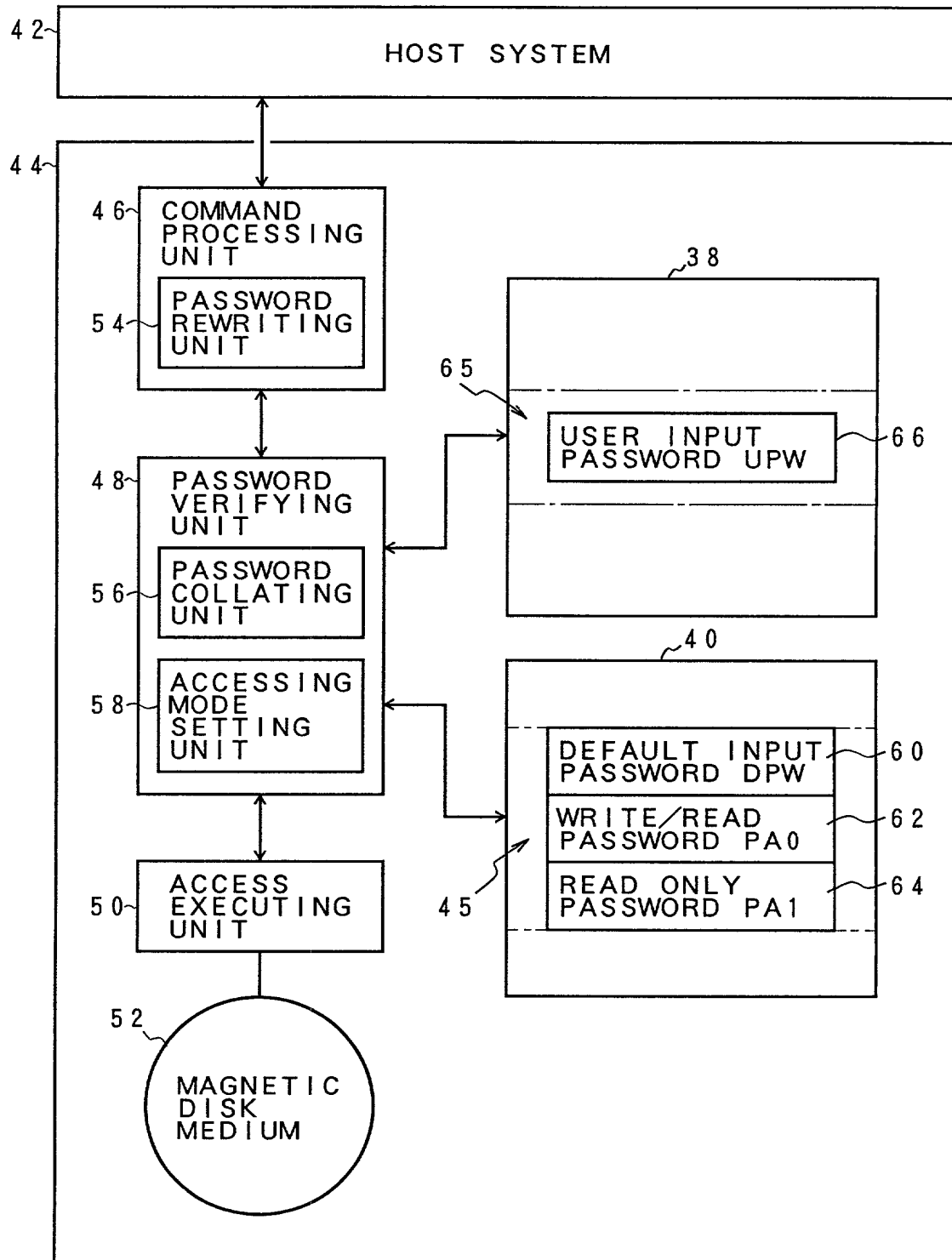


FIG. 3

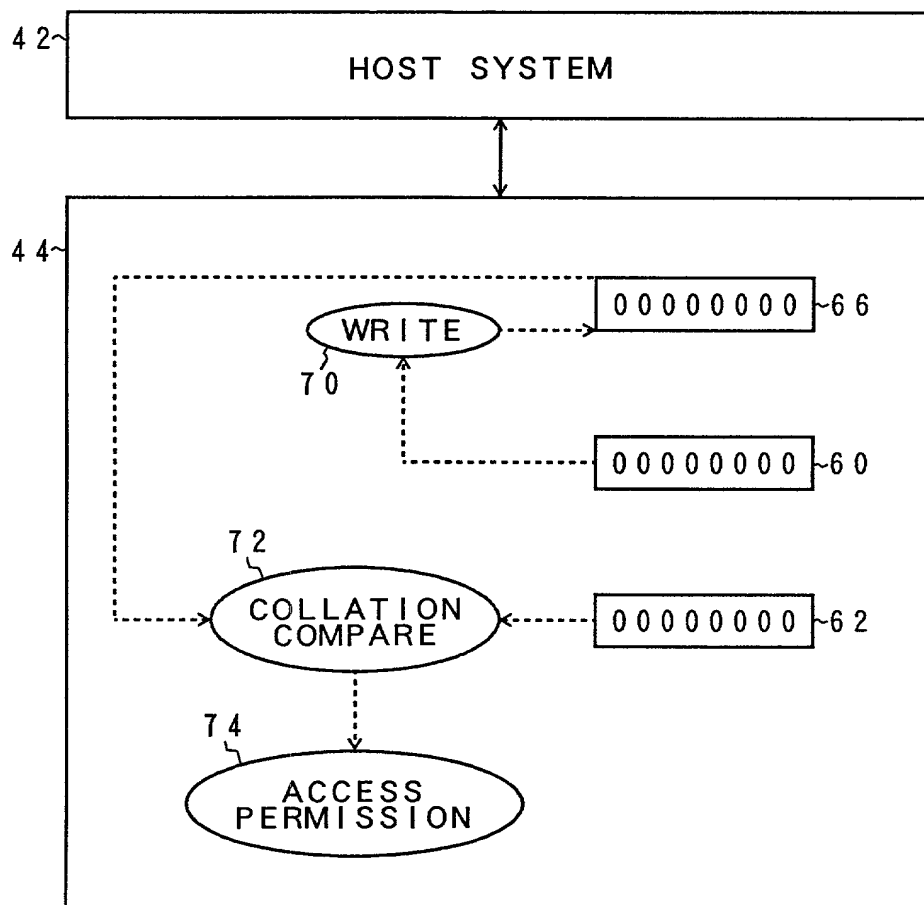




FIG. 4

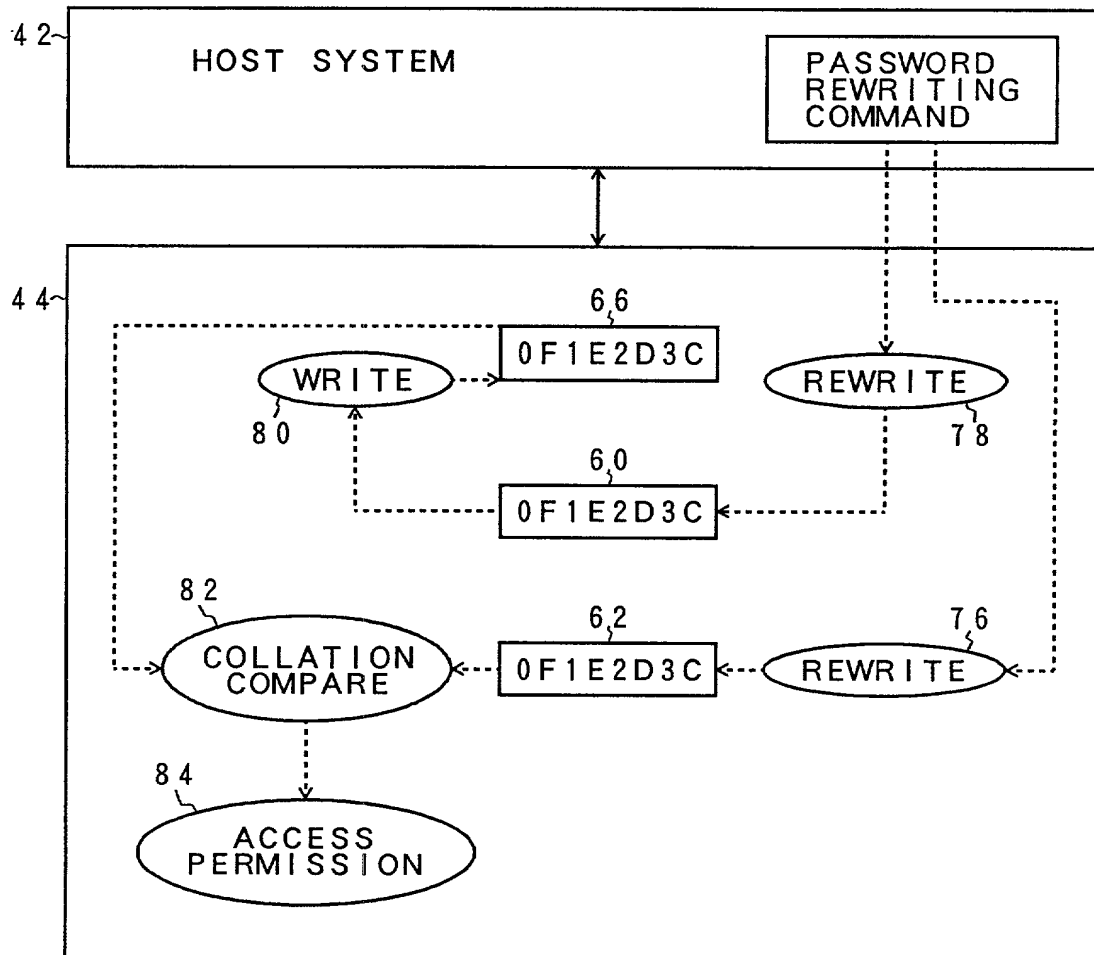


FIG. 5

MODE	ACCESS CONTENTS
WRITING/READING MODE	NORMAL READ COMMAND AND WRITE COMMAND ARE ACCEPTED. CHANGE OF EACH PASSWORD OF DEFAULT INPUT, READING, AND READING/WRITING IS PERMITTED.
READ ONLY MODE	ONLY NORMAL READ COMMAND IS ACCEPTED. CHANGE OF EACH PASSWORD OF DEFAULT INPUT, READING, AND READING/WRITING IS PERMITTED.
SECURITY MODE	ACCESS IS INHIBITED. ONLY READ COMMAND OR WRITE COMMAND ASSOCIATED WITH PASSWORD INPUT IS ACCEPTED.

FIG. 6

PRESERVING MODE	DEFAULT INPUT PASSWORD STORING POSITION	PASSWORD STORING POSITION
1	DRIVE	DRIVE
2	MEDIUM	MEDIUM
3	DRIVE	MEDIUM
4	MEDIUM	DRIVE

FIG. 7

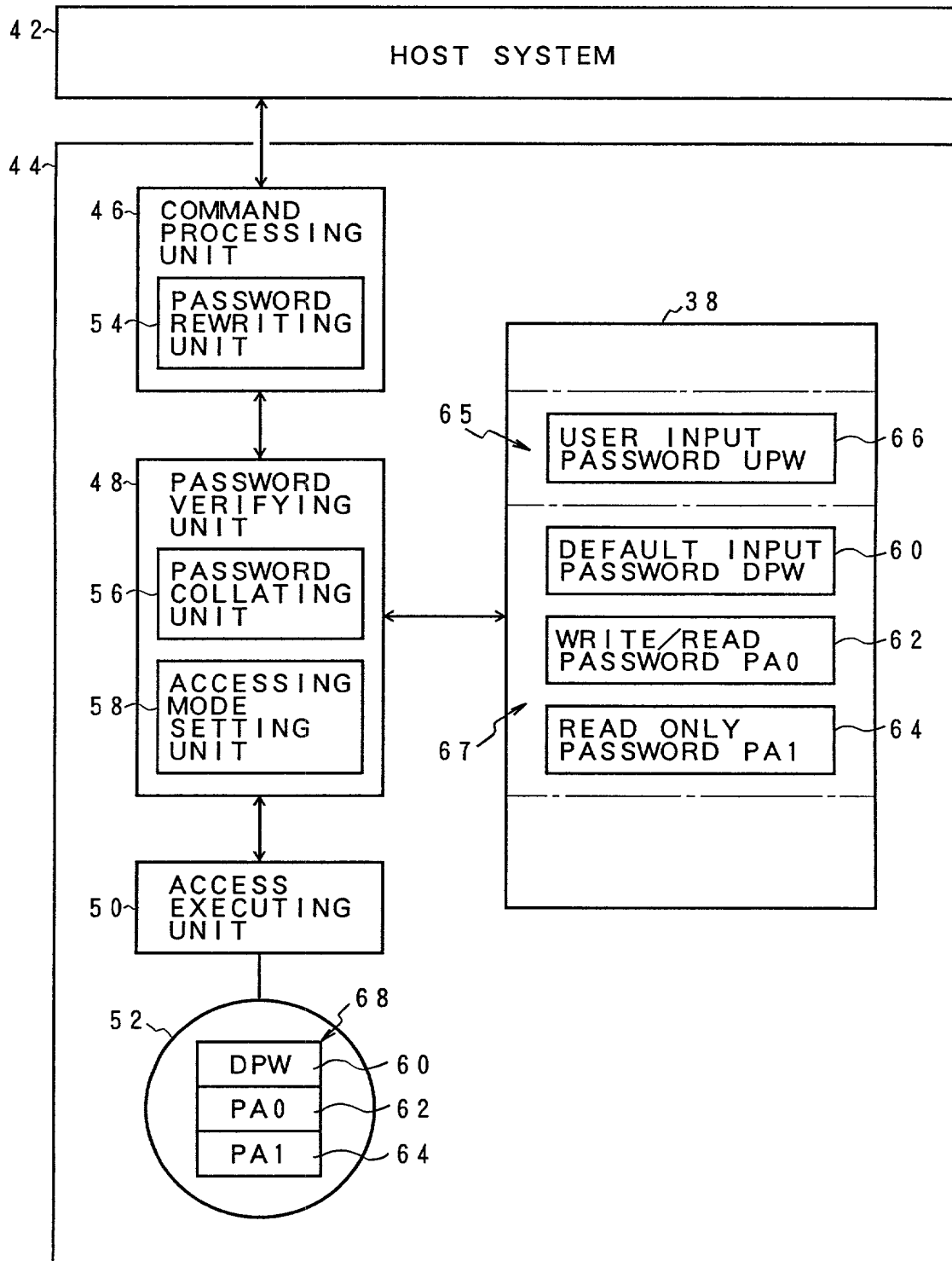


FIG. 8

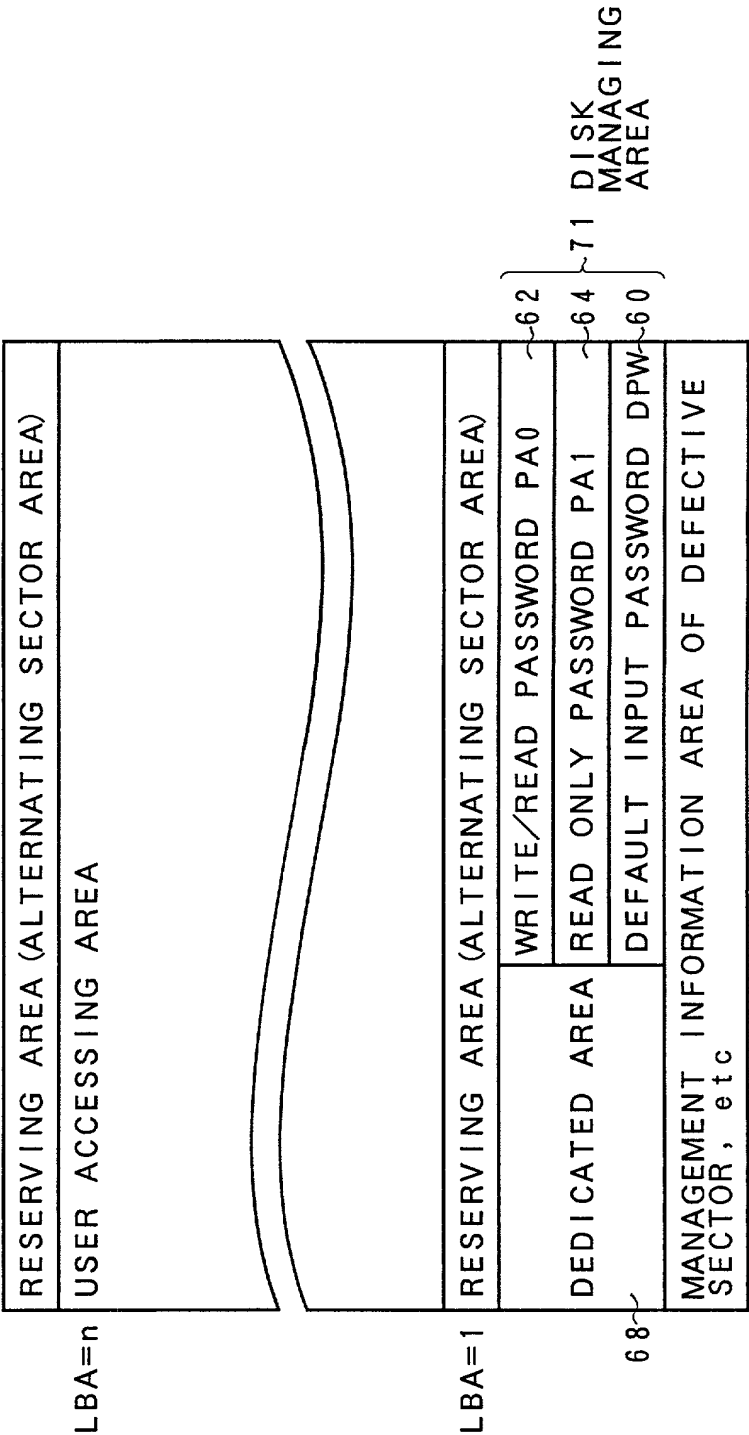


FIG. 9

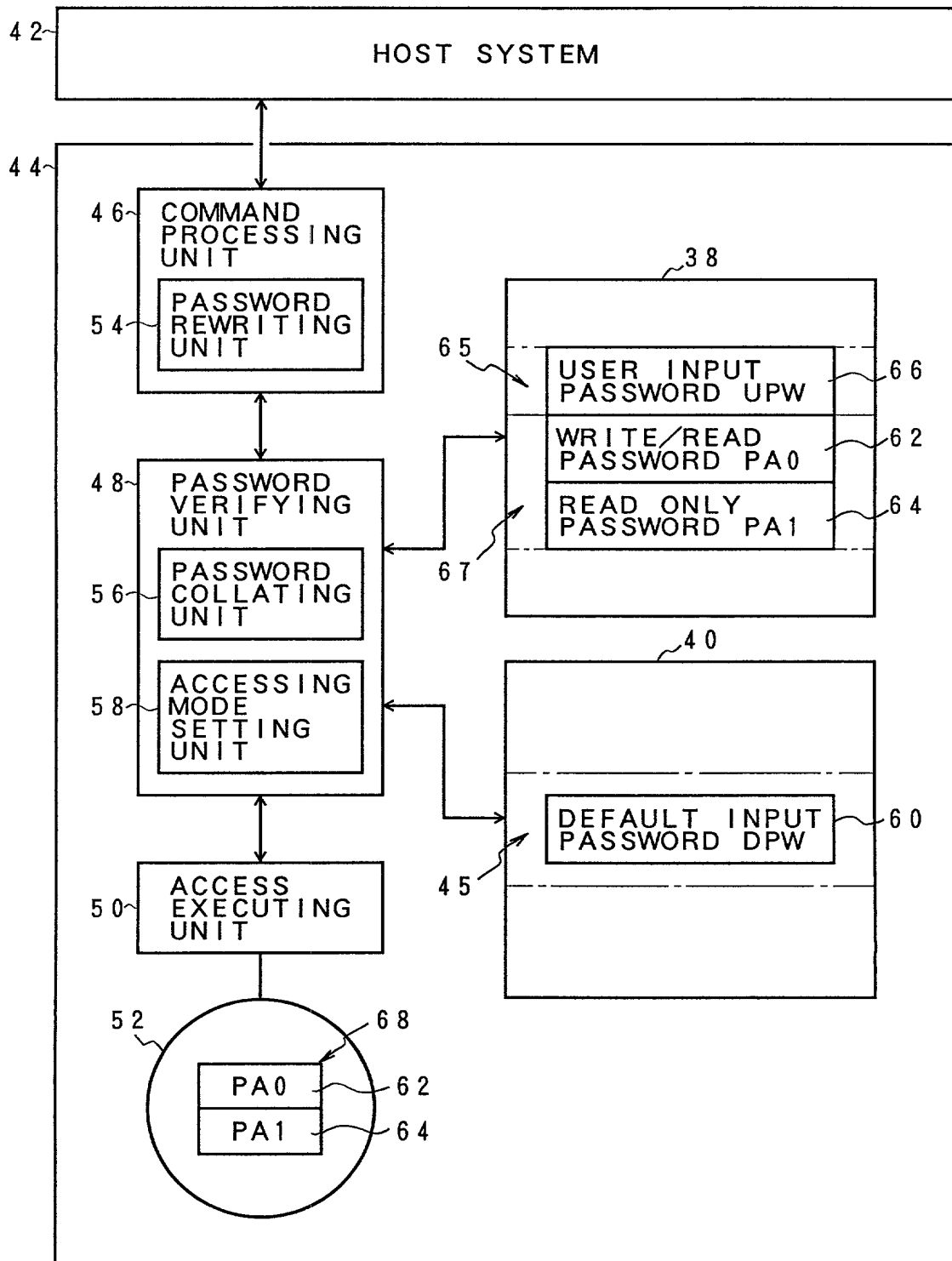


FIG. 10

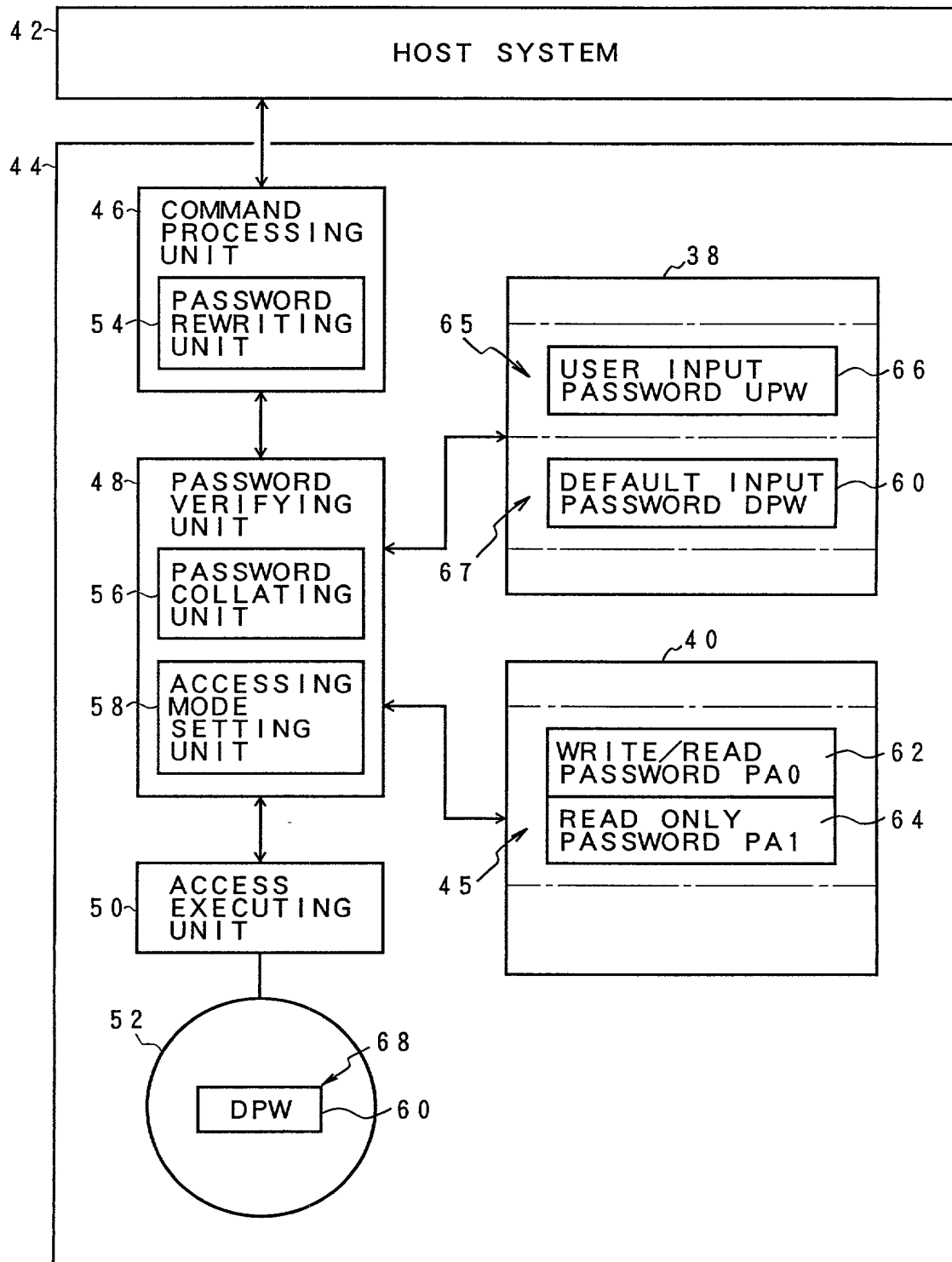


FIG. 11

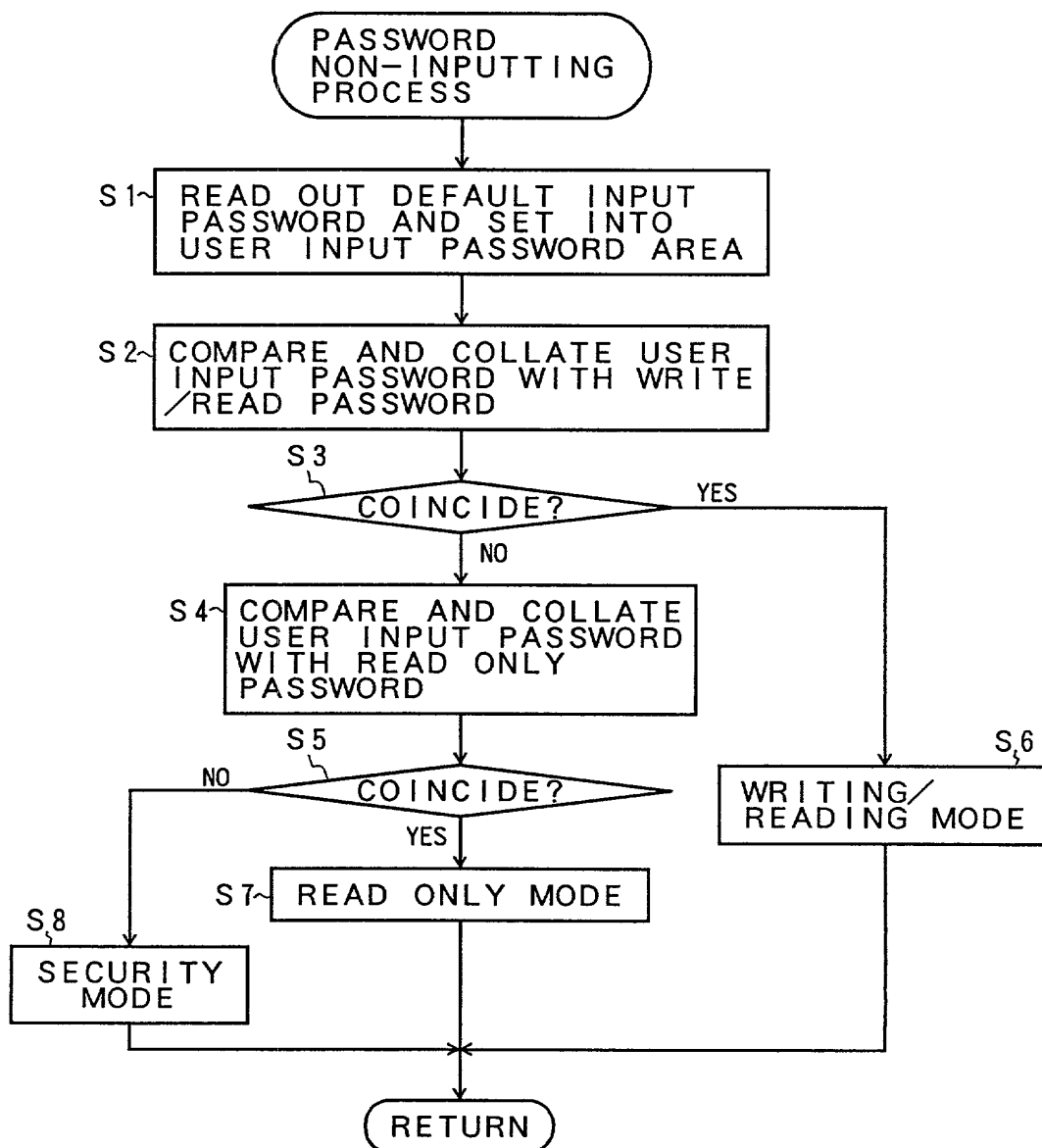




FIG. 12

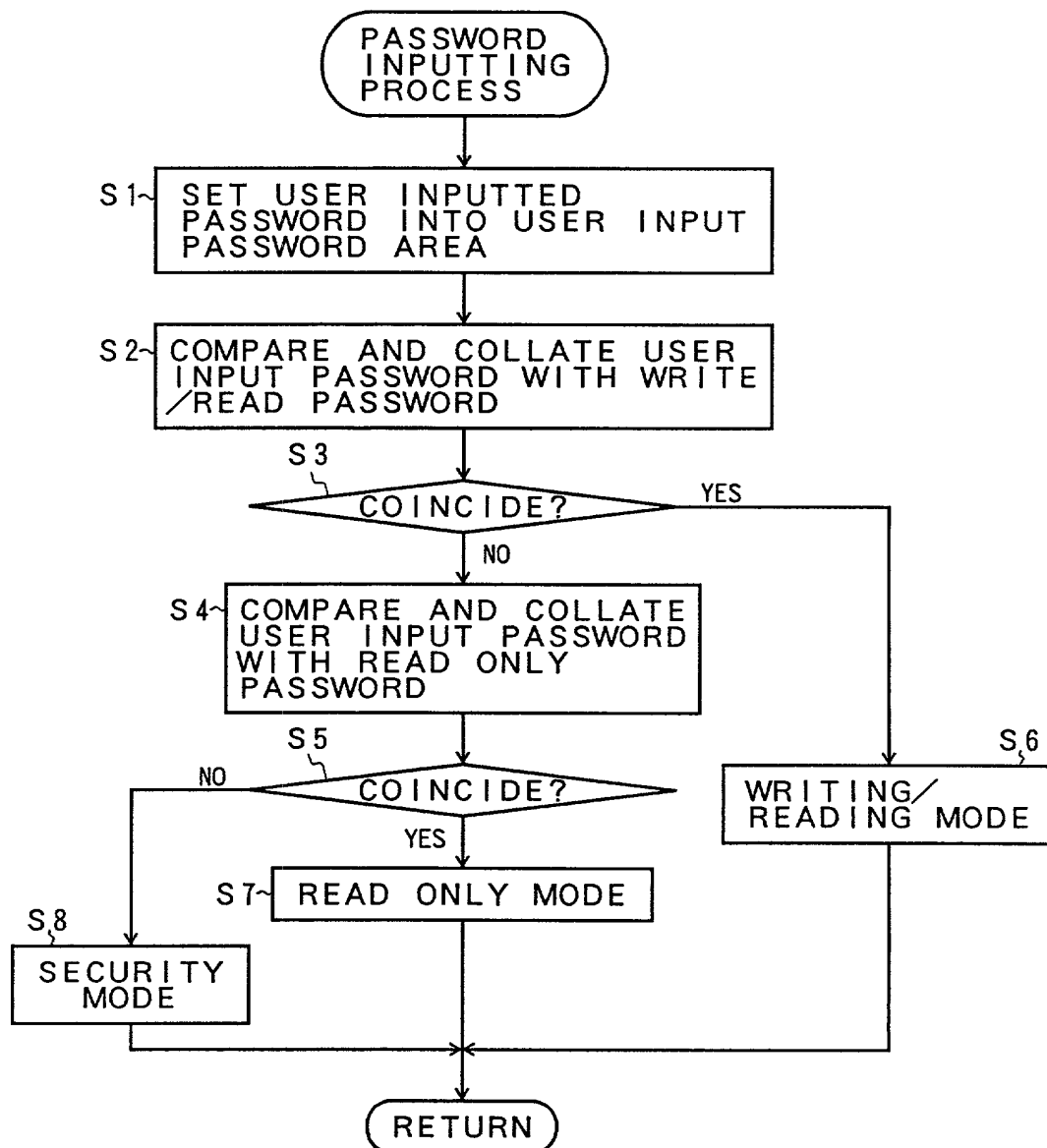


FIG. 13

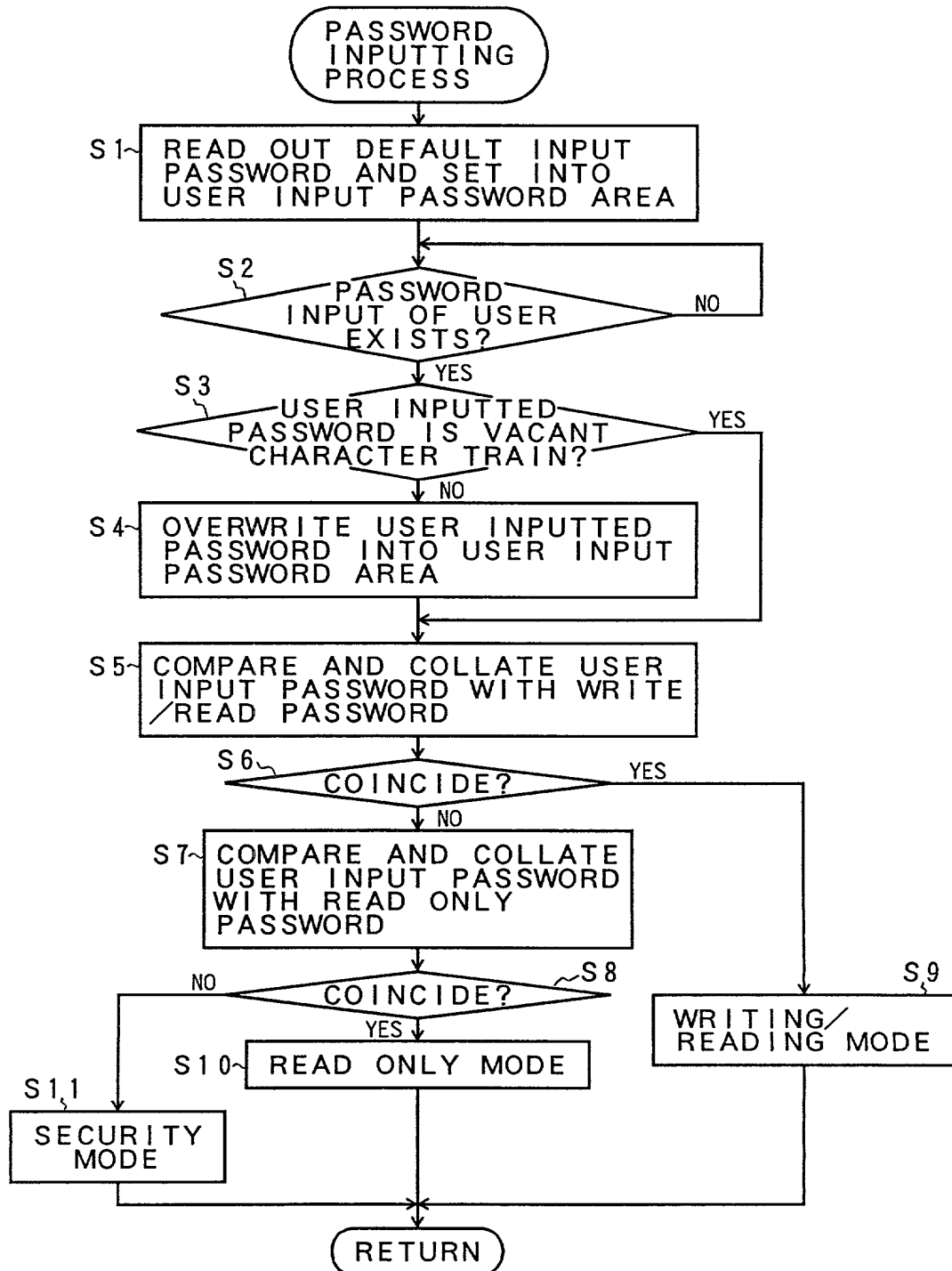


FIG. 14A

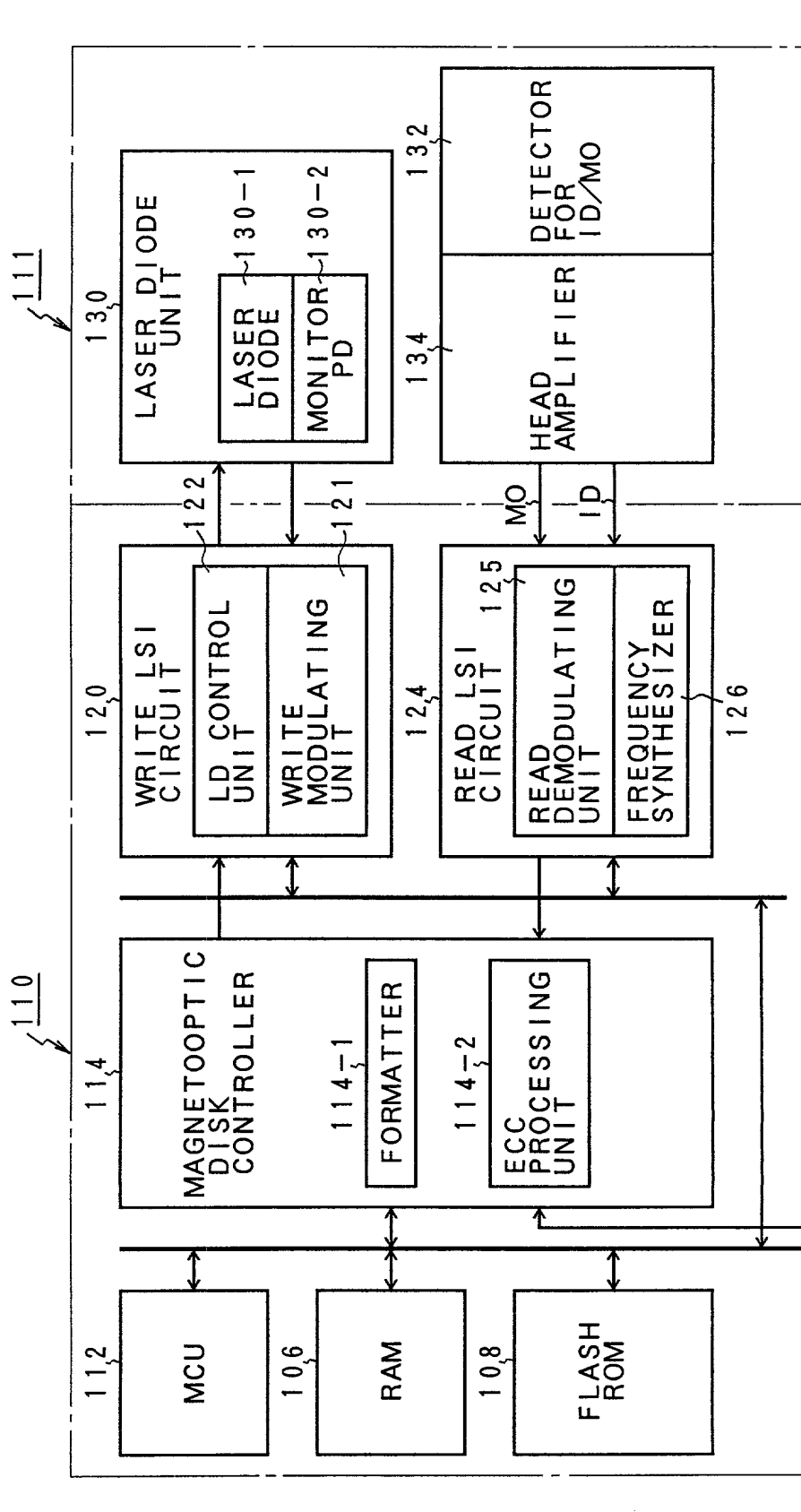


FIG. 14B

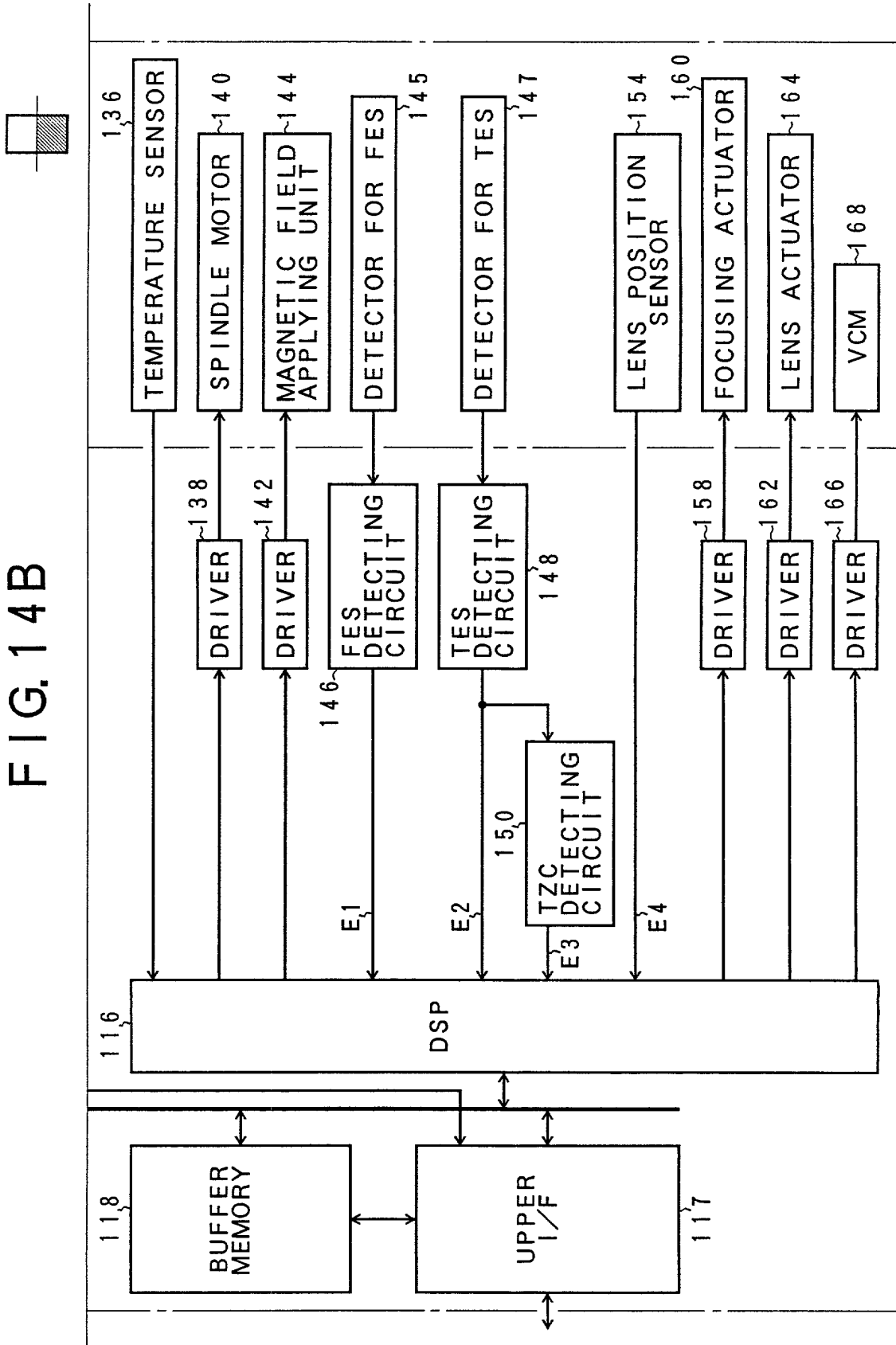


FIG. 15

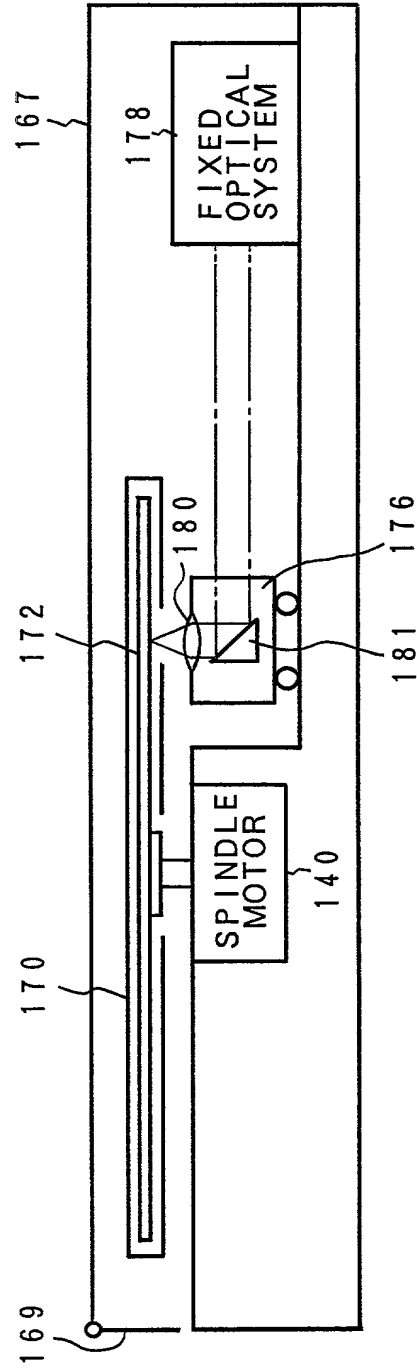


FIG. 16

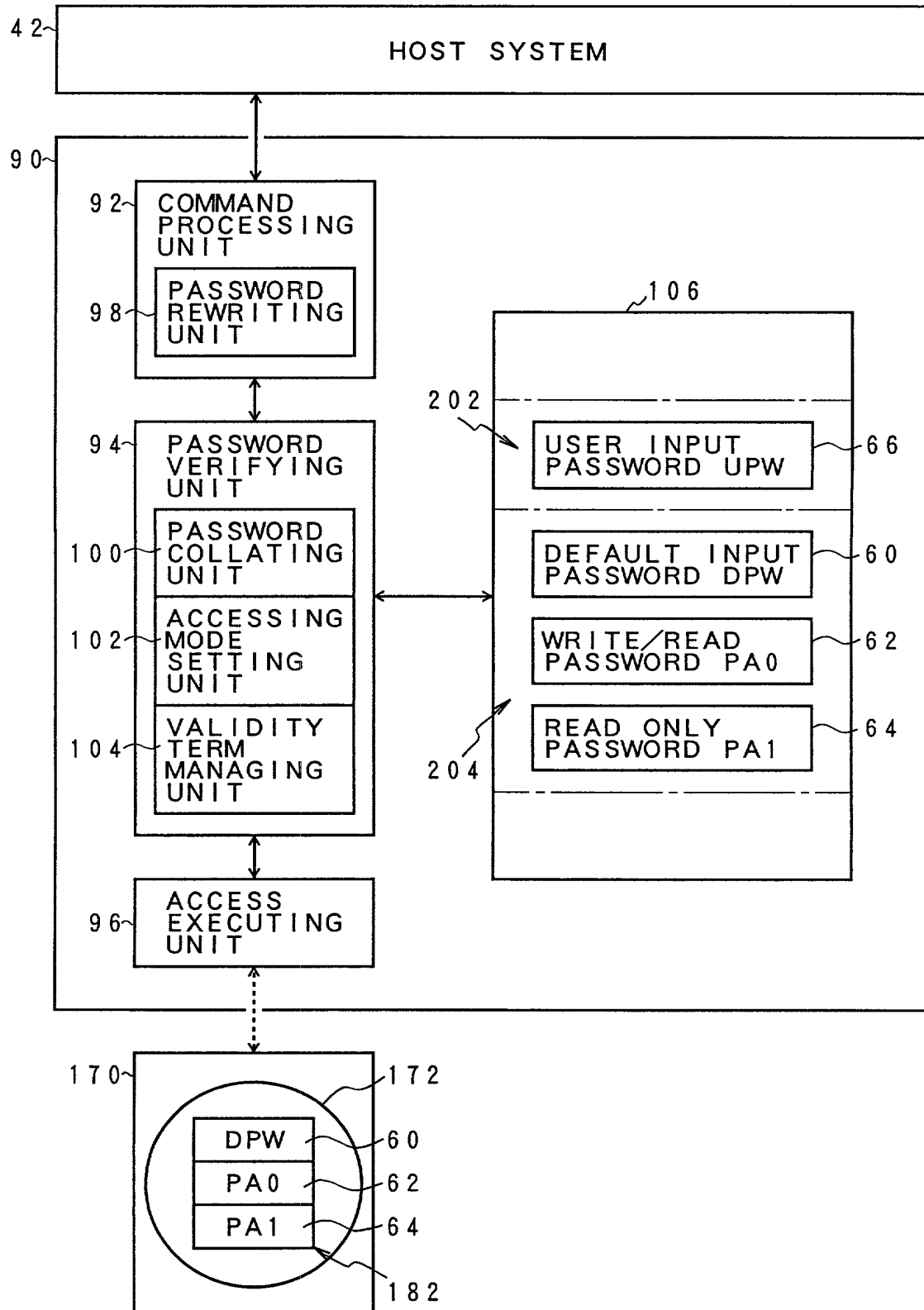


FIG. 17

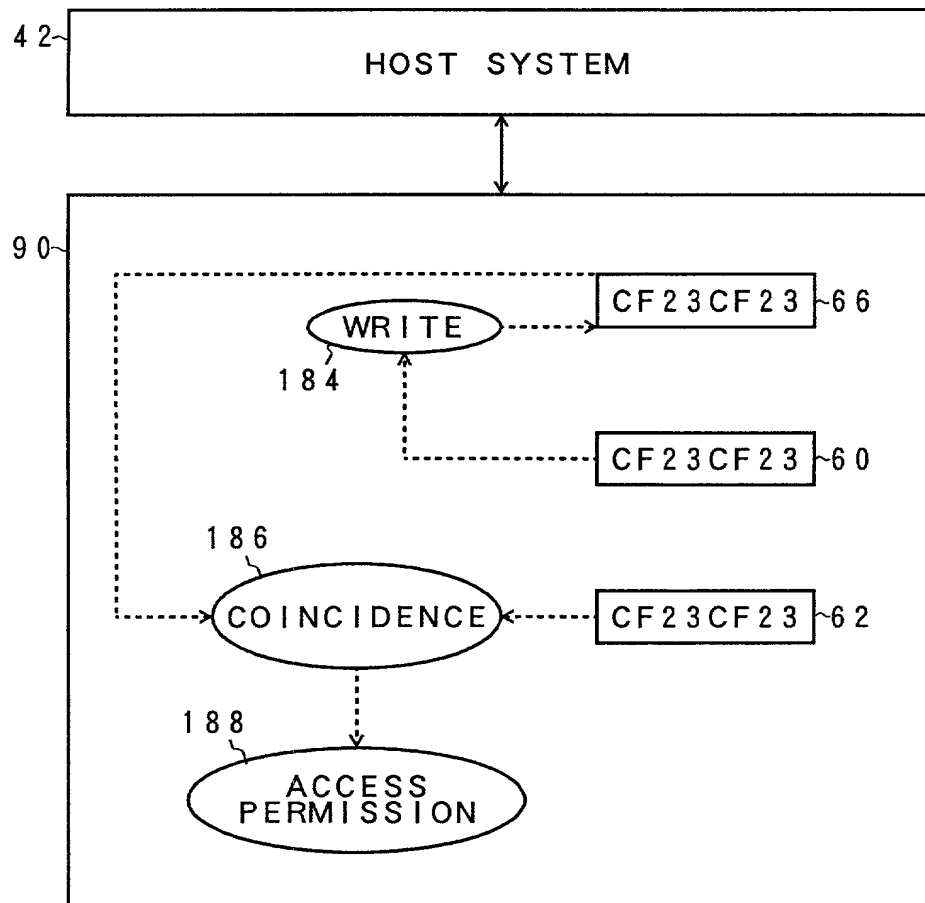


FIG. 18

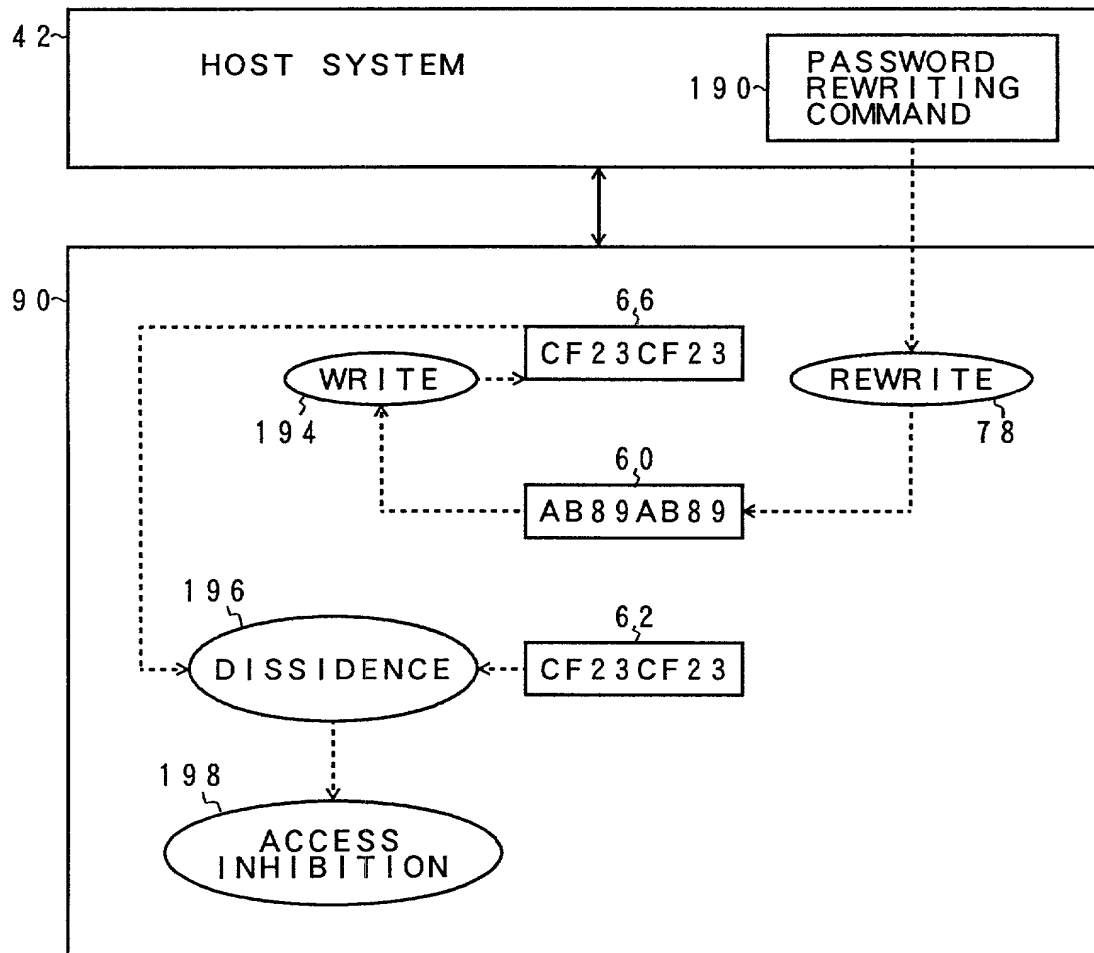




FIG. 19

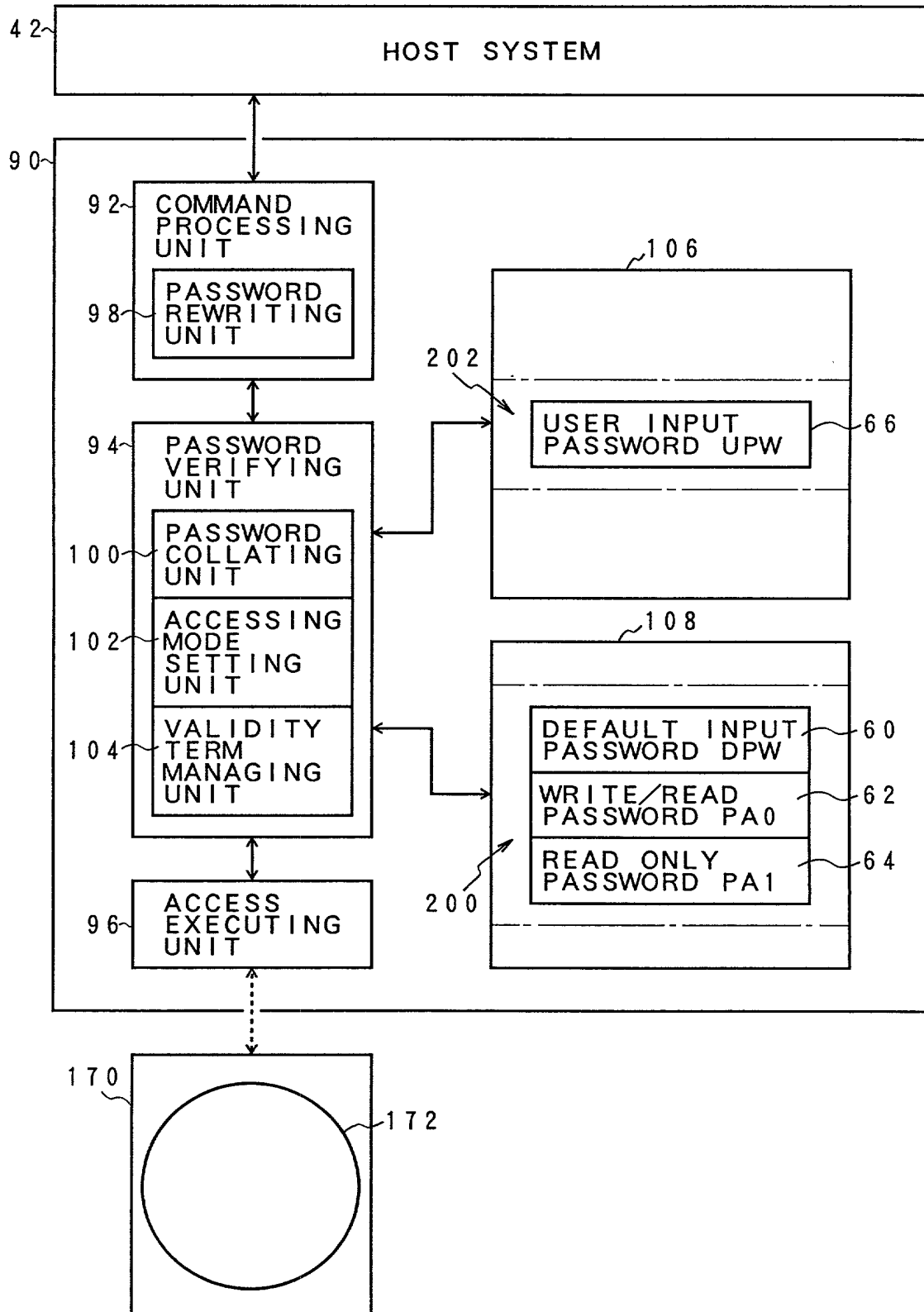


FIG. 20

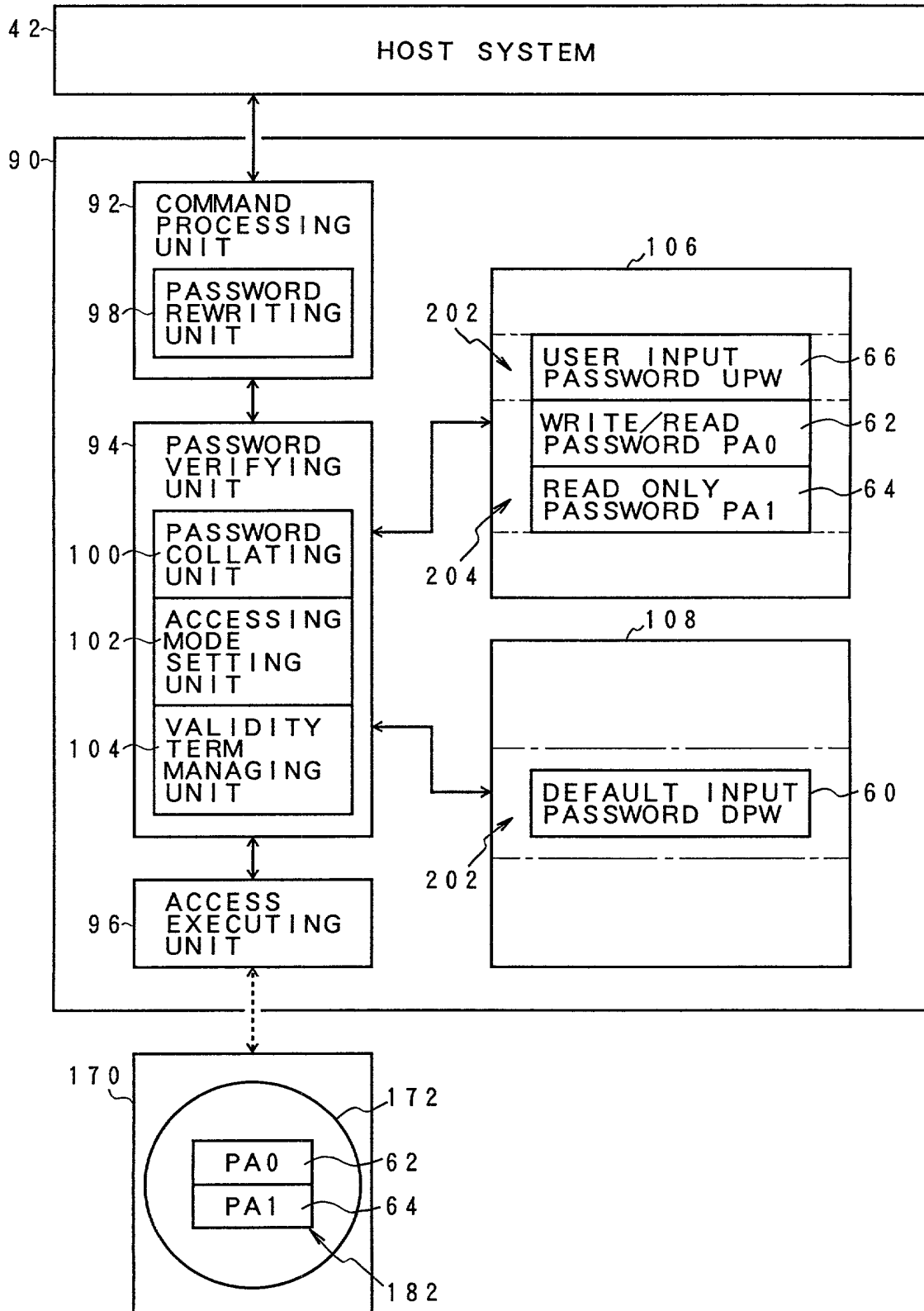


FIG. 21

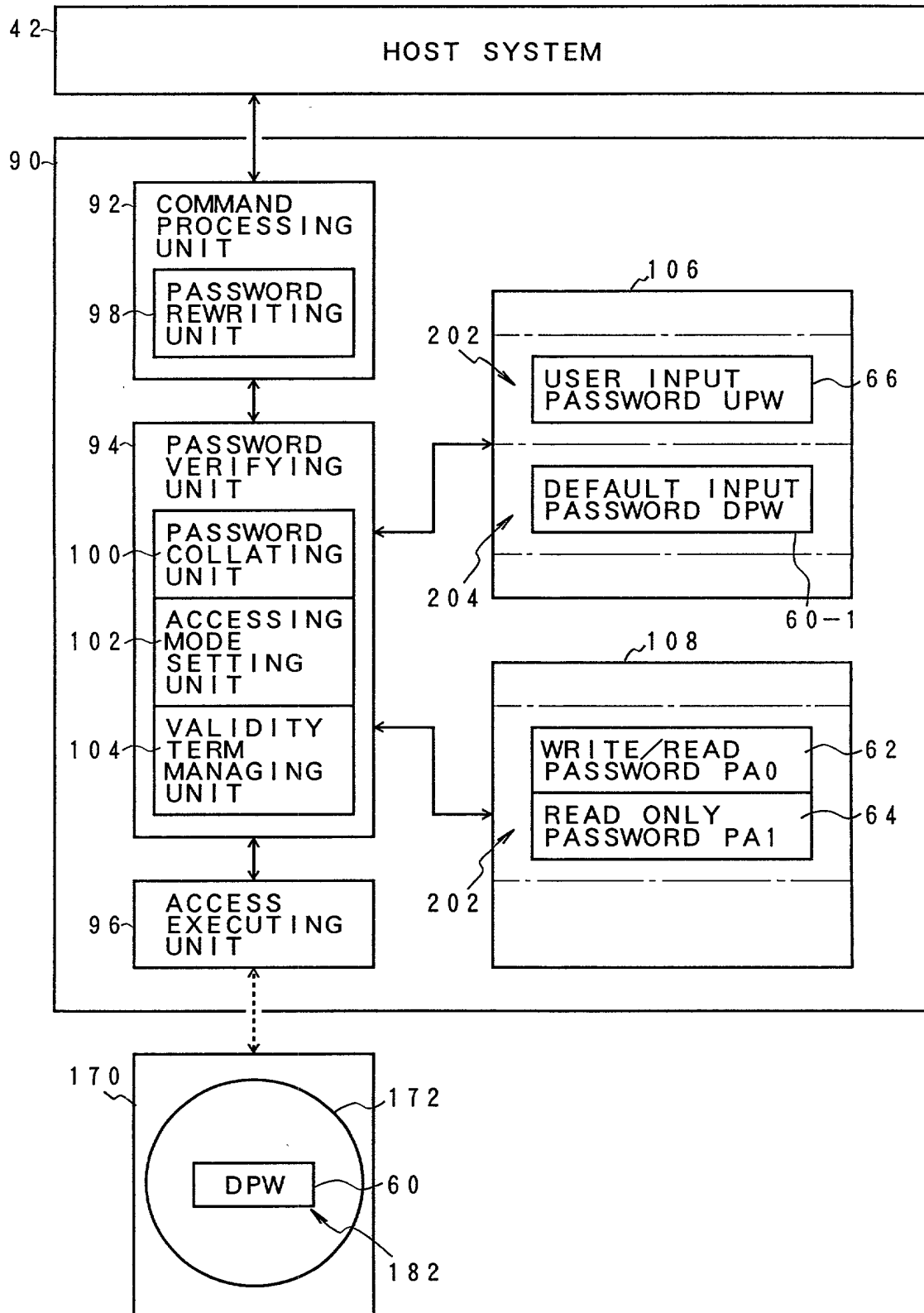


FIG. 22

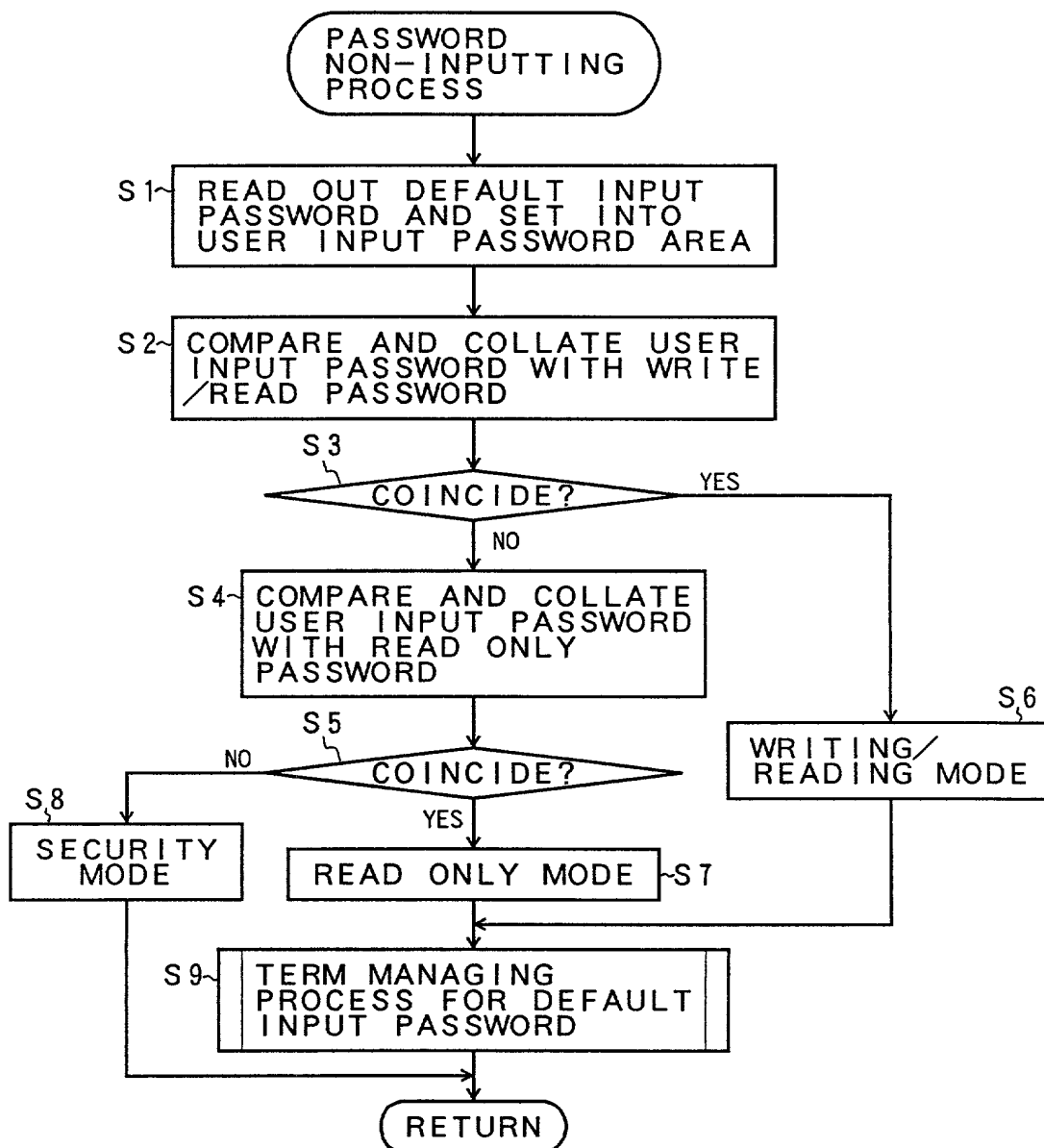


FIG. 23

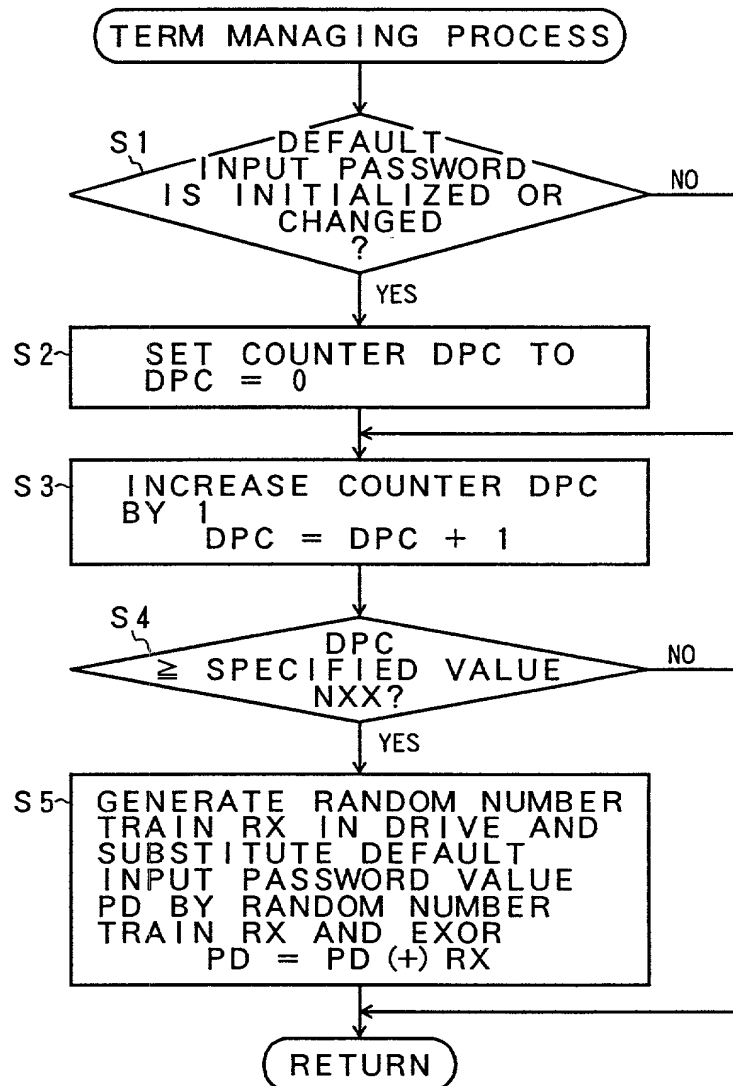
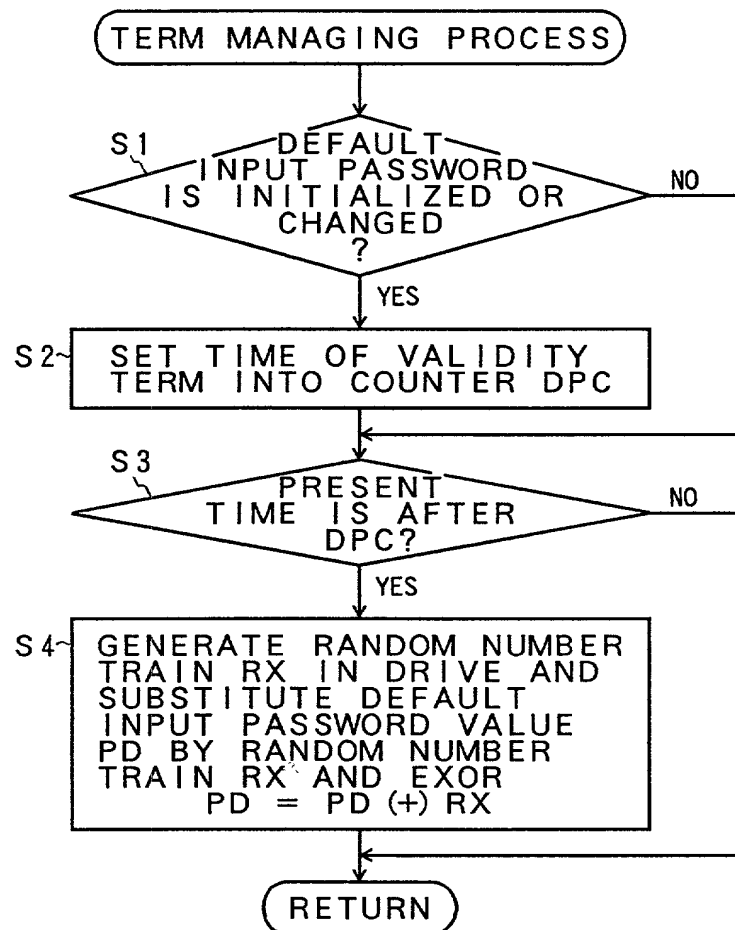


FIG. 24

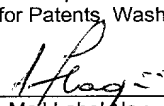


IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re U.S. Patent Application )  
 )  
 Applicant: Utsumi et al. )  
 )  
 Serial No. )  
 )  
 Filed: September 24, 1998 )  
 )  
 For: STORING APPARATUS )  
 AND PASSWORD CONTROL )  
 METHOD )  
 )  
 Art Unit: )

I hereby certify that this paper is being deposited with the United States Postal Service as Express Mail in an envelope addressed to: Asst. Comm. for Patents, Washington, D.C. 20231, on this date.

09/24/98  
 Date

  
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ASSOCIATE POWER OF ATTORNEY

Assistant Commissioner for Patents  
 Washington, D.C. 20231

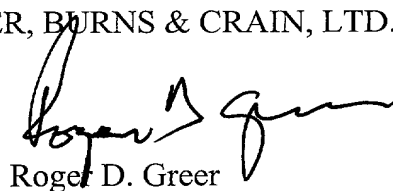
Dear Sir:

The undersigned attorney of record in the above-identified patent application hereby appoints James K. Folker, Registration No. 37,538, as associate attorney in said application to prosecute said application and to transact all business in the Patent and Trademark Office connected therewith, and requests that all correspondence continue to be directed to the Patrick G. Burns at the address of record, indicated below.

Respectfully submitted,

GREER, BURNS & CRAIN, LTD.

By

  
 Roger D. Greer

Registration No. 26,174

September 24, 1998  
 Suite 8660 - Sears Tower  
 233 S. Wacker Drive  
 Chicago, Illinois 60606-6501  
 Telephone: (312) 993-0080

# Declaration and Power of Attorney For Patent Application

## 特許出願宣言書

### Japanese Language Declaration.

私は、下欄に氏名を記載した発明者として、以下のとおり宣言する：

私の住所、郵便の宛先および国籍は、下欄に氏名に続いて記載したとおりであり、

名称の発明に関し、請求の範囲に記載した特許を求める主題の本来の、最初にして唯一の発明者である（一人の氏名のみが下欄に記載されている場合）か、もしくは本来の、最初にして共同の発明者である（複数の氏名が下欄に記載されている場合）と信じ、

その明細書を  
(該当する方に印を付す)

☐ ここに添付する。

☐ \_\_\_\_\_ 日に出願番号

第 0/ \_\_\_\_\_ 号として提出し、

\_\_\_\_\_ 日に補正した。  
(該当する場合)

私は、前記のとおり補正した請求の範囲を含む前記明細書の内容を検討し、理解したことを陳述する。

私は、連邦規則法典第37部第1章第56条(a)項に従い、本願の審査に所要の情報を開示すべき義務を有することを認める。

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Storing apparatus and password  
control method

the specification of which

(check one)

☒ is attached hereto.

☐ was filed on \_\_\_\_\_ as

Application Serial No. 0/ \_\_\_\_\_

and was amended on \_\_\_\_\_  
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).



# Japanese Language Declaration

私は、合衆国法典第35部第119条にもとづく下記の外国特許出願または発明者証出願の外国優先権利益を主張し、さらに優先権の主張に係わる基礎出願の出願日前の出願日を有する外国特許出願または発明者証出願を以下に明記する：

Prior foreign applications  
先の外国出願

10/065,281	Japan	16/3/98
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願の年月日)

Priority claimed  
優先権の主張

<input checked="" type="checkbox"/> Yes あり	<input type="checkbox"/> No なし
<input type="checkbox"/> Yes あり	<input type="checkbox"/> No なし
<input type="checkbox"/> Yes あり	<input type="checkbox"/> No なし

私は、合衆国法典第35部第120条にもとづく下記の合衆国特許出願の利益を主張し、本願の請求の範囲各項に記載の主題が合衆国法典第35部第112条第1項に規定の様態で先の合衆国出願に開示されていない限度において、先の出願の出願日と本願の国内出願日またはPCT国際出願日の間に公表された連邦規則法典第37部第1章第56条(a)項に記載の所要の情報を開示すべき義務を有することを認める：

0/	
(Application Serial No.) (出願番号)	(Filing Date) (出願日)
0/	
(Application Serial No.) (出願番号)	(Filing Date) (出願日)

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(現況) (特許済み、係属中、放棄済み)	(Status) (patented, pending, abandoned)
(現況) (特許済み、係属中、放棄済み)	(Status) (patented, pending, abandoned)

私は、ここに自己の知識にもとづいて行った陳述がすべて真実であり、自己の有する情報および信ずるところに従って行った陳述が真実であると信じ、さらに故意に虚偽の陳述等を行った場合、合衆国法典第18部第1001条により、罰金もしくは禁錮に処せられるか、またはこれらの刑が併科され、またかかる故意による虚偽の陳述が本願ないし本願に対して付与される特許の有効性を損うことがあることを認識して、以上の陳述を行ったことを宣言する。

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

# Japanese Language Declaration

委任状：私は、下記発明者として、以下の代理人をここに送任し、本願の手続を遂行すること並びにこれに関する一切の行爲を特許商標庁に対して行うことを委任する。  
(代理人氏名および登録番号を明記のこと)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

## Attorney

## Reg. No.

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Roger D. Greer	26,174
Lawrence J. Crain	31,497
Christopher J. Reckamp	34,414
Steven P. Fallon	35,132

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233 South Wacker Drive  
Chicago, Illinois 60606

## 直通電話連絡先：(名称および電話番号)

## Direct Telephone Calls to: (name and telephone number)

Patrick G. Burns  
(312) 993-0080

唯一のまたは第一の発明者の氏名	Full name of sole or first inventor Kenichi Utsumi	
同発明者の署名	日付	Inventor's signature Kenichi Utsumi Date 16/9/98
住所	Residence Kawasaki, Japan	
国籍	Citizenship Japan	
郵便の宛先	Post Office Address c/o FUJITSU LIMITED 1-1, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki-shi, Kanagawa 211-8588, Japan	
第2の共同発明者の氏名 (該当する場合)	Full name of second joint inventor, if any Yoshiaki Uchida	
同第2発明者の署名	日付	Second Inventor's signature Yoshiaki Uchida Date 16/9/98
住所	Residence Kawasaki, Japan	
国籍	Citizenship Japan	
郵便の宛先	Post Office Address c/o FUJITSU LIMITED 1-1, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki-shi, Kanagawa 211-8588, Japan	

... (第6またはそれ以降の共同発明者に対しても同様な情報および署名を提供すること。)

(Supply similar information and signature for third and subsequent joint inventors.)

# Japanese Language Declaration

第3の共同発明者の氏名 (該当する場合)		Full name of 3rd joint inventor, if any	
		Hiroyuki Kobayashi	
同第3 発明者の署名	日付	3rd Inventor's signature	Date
		Hiroyuki Kobayashi	16/9/98
住所		Residence	
		Kawasaki, Japan	
国籍		Citizenship	
		Japan	
郵便の宛先		Post Office Address	
		c/o FUJITSU LIMITED 1-1, Kamikodanaka 4-chome, Nakahara-ku, Kawasaki-shi, Kanagawa 211-8588, Japan	
第4の共同発明者の氏名 (該当する場合)		Full name of 4th joint inventor, if any	
同第4 発明者の署名	日付	4th Inventor's signature	Date
住所		Residence	
国籍		Citizenship	
郵便の宛先		Post Office Address	
第5の共同発明者の氏名 (該当する場合)		Full name of 5th joint inventor, if any	
同第5 発明者の署名	日付	5th Inventor's signature	Date
住所		Residence	
国籍		Citizenship	
郵便の宛先		Post Office Address	
第6の共同発明者の氏名 (該当する場合)		Full name of 6th joint inventor, if any	
同第6 発明者の署名	日付	6th Inventor's signature	Date
住所		Residence	
国籍		Citizenship	
郵便の宛先		Post Office Address	

(第7またはそれ以降の共同発明者に対しても同様な情報および署名を提供すること。)

(Supply similar information and signature for 7th and subsequent joint inventors.)